INSTITUTE OF SCIENCE
MANILA
1901

SCIENTIFIC LIBRARY

Sc. Lib. Form No. 13

THE PHILIPPINE JOURNAL OF SCIENCE

VOLUME 75

MAY TO AUGUST, 1941

WITH 42 PLATES AND 44 TEXT FIGURES

BUREAU OF SCIENCE
MANILA

STI-12-8724

MANILA
BUREAU OF PRINTING
1941

53874

Q1 P55

DEPARTMENT OF AGRICULTURE AND COMMERCE

Benigno S. Aquino, *Secretary*
José S. Camus, *Under Secretary*

THE PHILIPPINE JOURNAL OF SCIENCE

Published by the Bureau of Science, Department of Agriculture and Commerce

[Entered at the Post Office at Manila, Philippines, as second-class matter.]

A. S. Argüelles, D.Sc., *Editor*
Eduardo Quisumbing, Ph.D., *Associate Editor*
Eduardo R. Alvarado, A.B., LL.B., *Managing Editor*
Sophie Rodolfo, M.A., *Copy Editor*

Chemistry

Manuel L. Roxas, Ph.D.; A. P. West, Ph.D.; T. Dar Juan, Phar.D.
Joaquin Marañon, D.Sc.; Patrocinio Valenzuela, Ph.D.
Marcos M. Alicante, Ph.D.; F. T. Adriano, Ph.D.; R. H. Aguilar, Ch.E.
A. J. Hermano, D.Sc.; V. G. Lava, Ph.D.; J. C. Espinosa, B.S.
Maria Y. Orosa, M.S.

Geology

Q. A. Abadilla, E.M.; V. Elicaño B.S.; José M. Feliciano, Ph.D.
Antonio D. Alvir, Ph.D.

Experimental Medicine

Daniel de la Paz, M.D.; H. W. Wade, M.D.; Arturo Garcia, M.D.
Onofre Garcia, M.D.; Cristobal Manalang, M.D.
Isabelo Concepcion, M.D.; Victor Buencamino, D.V.M.

Clinical Medicine

Antonio Sison, M.D.; Liborio Gomez, M.D., Ph.D.
José Albert, M.D.; H. Lara, M.D.
José Rodriguez, M.D.; Carmelo Reyes, M.D.

Botany

Elmer D. Merrill, D.Sc.; E. B. Copeland, Ph.D.
A. F. Fischer, C.E., M.F.; T. G. Fajardo, Ph.D.
Rafael B. Espino, Ph.D.; Nicanor G. Teodoro, Ph.D.
José B. Juliano, Ph.D.; Feliciano M. Clara, Ph.D.
J. K. Santos, Ph.D.

Zoölogy

Hilario A. Roxas. Ph.D.; Marcos A. Tubangui, D.V.M.
Leopoldo B. Uichanco, D.Sc.; Heraclio R. Montalban, M.A.
Gonzalo Merino, Ph.D.; Faustino Q. Otanes, M.S.
Manuel D. Sumulong, M.S., D.V.M.; Lope M. Yutoc, D.V.M.
Deogracias Villadolid, Ph.D.; Canuto G. Manuel, D.Sc.

Anthropology

H. O. Beyer, M.A.; E. E. Schneider, B.L.
Ricardo E. Galang, M.S.

10.4-66

CONTENTS

No. 1, May, 1941

[Issued July 23, 1941.]

Page.

GRESSITT, J. LINSLEY. Amphibians and reptiles from southeastern China 1

One plate.

BEQUAERT, J. The hornets of the Philippines: Hymenoptera, Diploptera, Vespinæ 61

TUBANGUI, MARCOS A., and PANTALEON J. AGUILA. The treatment of schistosomiasis japonica with fuadin 69

RAMIRO, MARIANO P., and PRESENTACION A. ESTRADA. Soda process for pulping Canton fiber 75

INTENGAN, CARMEN LL., and AUGUSTUS P. WEST. Preparation and analysis of run Manila copal 83

Three text figures.

BOOKS 97

No. 2, June, 1941

[Issued August 22, 1941.]

YUTUC, LOPE M. Experimental studies on the curative treatment of surra in native horses in the Philippines, III: With a report on the results obtained in British North Borneo 105

TUBANGUI, MARCOS A., and VICTORIA A. MASILUÑGAN. Trematode parasites of Philippine vertebrates, IX: Flukes from the domestic fowl and other birds 131-141

Three plates.

LAVA, V. G., P. E. TORRES, and S. SANVICTORES. Chemical studies on coconut products, IV: Further data on a new process for the extraction of coconut oil 143

One text figure.

OPIANA, GIL O. Clay-asbestos shingles 159

Two plates.

MENDOZA, JOSÉ M., and SIMEONA LEUS-PALO. New or noteworthy Philippine fungi, III 165

Nine text figures.

CAPCO, SANTIAGO R. Notes on the orchid bug, Mertila malayensis Distant, on white mariposa (Phalaenopsis amabilis Blume) 185

Two plates.

Page.
VANOVERBERGH, MORICE. Supplementary notes on the Iloko verb 197
BOOKS 227

No. 3, July, 1941

[Issued September 4, 1941.]

MANALO, GLORIA D., and AUGUSTUS P. WEST. Reducing the acidity of Manila copal: Reaction of run copal and glycerol 233
One text figure.
JULIANO, JOSÉ B. Callus development in graft union 245
Four plates.
YUTUC, LOPE M. Studies on the influence of splenectomy on natural and acquired immunity of rats to Nippostrongylus muris 255
ALVIR, A. D. The origin of placer gold in Santa Maria River, Bulacan 279
One plate.
ACENA, SERGIO P. Preliminary notes on a trematode with two yolk reservoirs and a new species of Lecithochirium 285
Two plates.
GALANG, RICARDO E. Types of watercraft in the Philippines 291
Thirteen plates.
SMITH, LOUISE VICTORIA. Labidocera glauca sp. nov., a blue copepod of Puerto Galera Bay, Mindoro 307
One plate and six text figures.
BEY-BIENKO, G. Blattodea from Los Baños, Luzon, Philippines 323
Six text figures.
BOOKS 339

No. 4, August, 1941

[Issued September 25, 1941.]

COPELAND, EDWIN B. Gleicheniaceæ of New Guinea 347
Six plates.
BAENS, LUZ. Tannin from kernels of green betel nuts 363
CHIN, T. G. Studies on the biology of the Amoy amphioxus, Branchiostoma belcheri Gray 369
Five plates and eighteen text figures.
GALANG, RICARDO E. Filing and blackening of teeth among some Philippine ethnic groups 425
Two plates.
BOOKS 433
ERRATA 441
INDEX 443

THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 75 MAY, 1941 NO. 1

AMPHIBIANS AND REPTILES FROM SOUTHEASTERN CHINA[1]

By J. LINSLEY GRESSITT

*Of the Lingnan Natural History Survey and Museum,
Lingnan University, Canton, China*

ONE PLATE

The following notes and descriptions are based entirely upon a collection of amphibians and reptiles, numbering over nine-hundred specimens, made by me during the summer of 1936, in the adjacent portions of Kwangtung, Kiangsi, and Fukien provinces in the eastern part of South China. The collection is permanently deposited in the Museum of Vertebrate Zoology of the University of California in Berkeley. The numbers by which the specimens are listed are those of the Museum of Vertebrate Zoology (M. V. Z.). The collection is interesting as being from a part of China that has been very little collected herpetologically. For this reason a number of species can be added to those known from the three provinces visited, as is demonstrated by the three lists of the species collected in Kiangsi, Kwangtung, and Fukien Provinces, respectively, that follow—the new provincial records being asterisked. The list for Kiangsi Province, where the largest number of species was collected, is particularly striking, in that nearly one-half of the species are new to the province. After the provincial lists, the species are listed according to the altitudinal ranges in which they were collected to indicate something of the life zoning in this region. This list is followed by the annotated list of species.

---

[1] Contribution from the Lingnan Natural History Survey and Museum.

The collection numbers 63 species in all, including 1 newt (salamander), 1 toad, 18 frogs, 5 burrowing frogs, 6 lizards, 25 snakes, and 7 turtles. Forty-one species were collected in Kiangsi Province, 40 in Kwangtung Province, and 32 in Fukien Province. Of the 63 species, 1 has already been described as a new species: a snake, *Natrix boulengeri* Gressitt,[2] from Kwangtung and Kiangsi Provinces. The writer has also published a brief account of the trip, together with a map and an annotated list of localities at which specimens were collected.[3]

An expression of appreciation is extended to the late Dr. Joseph Grinnell, Dr. Jean M. Linsdale, Mr. Clifford H. Pope, and Dr. Alice M. Boring for their cooperation and advice in connection with this study, and also to the Rev. A. H. Page, the Misses Louise and Dorothy Campbell, Mr. and Mrs. David M. Campbell, the Rev. and Mrs. E. S. Burket, the Rev. and Mrs. Arthur S. Adams, and others of the South China Baptist Mission; and Prof. and Mrs. W. E. Hoffmann, Dr. Franklin P. Metcalf, and Dr. and Mrs. F. A. McClure of Lingnan University, Canton, for extensive aid and kindness during the trip.

SPECIES COLLECTED IN KIANGSI PROVINCE

[Single asterisks are new provincial records; double asterisks mark new species.]

1. *Bufo melanostictus.*
2. *Hyla chinensis.*
*3. *Rana adenopleura.*
4. *Rana fukiensis.*
5. *Rana guentheri.*
6. *Rana japonica.*
*7. *Rana kuhlii.*
*8. *Rana latouchei.*
9. *Rana limnocharis.*
10. *Rana nigromaculata reinhardti.*
*11. *Rana schmackeri.*
12. *Rana spinosa.*
*13. *Staurois ricketti.*
*14. *Rhacophorus leucomystax.*
15. *Rhacophorus dennysi.*
*16. *Microhyla butleri.*
*17. *Microhyla heymonsi.*
18. *Microhyla ornata.*
*19. *Platysternon megacephalum.*
20. *Trionyx sinensis.*
21. *Gekko subpalmatus.*
22. *Eumeces chinensis.*
*23. *Sphenomorphus indicus.*
24. *Natrix æquifasciata.*
**25. *Natrix boulengeri.*
26. *Natrix percarinata.*
27. *Natrix piscator.*
*28. *Natrix sauteri.*
29. *Natrix stolata.*
*30. *Pseudoxenodon bambusicola.*
31. *Opisthotropis latouchii.*
*32. *Opisthotropis maxwelli.*
*33. *Zaocys dhumnades montanus.*
34. *Ptyas korros.*
35. *Eurypholus major.*
36. *Holarchus formosanus.*
37. *Calamaria septentrionalis.*
38. *Enhydris chinensis.*
*39. *Enhydris plumbea.*
40. *Bungarus multicinctus.*
41. *Trimeresurus mucrosquamatus.*

---

[2] Proc. Biol. Soc. Wash. 50 (1937) 125–128.

[3] Lingnan Sci. Journ. 16 (1937) 439–445.

SPECIES COLLECTED IN KWANGTUNG PROVINCE

[Single asterisks are new provincial records; double asterisks mark new species.]

1. *Pachytriton brevipes.*
2. *Bufo melanostictus.*
3. *Hyla chinensis.*
4. *Rana guentheri.*
5. *Rana japonica.*
6. *Rana limnocharis.*
7. *Rana tigerina rugulosa.*
8. *Rana spinosa.*
9. *Rhacophorus leucomystax.*
10. *Kaloula pulchra.*
*11. *Microhyla heymonsi.*
12. *Microhyla ornata.*
13. *Microhyla pulchra.*
14. *Platysternon megacephalum.*
15. *Cyclemys trifasciata.*
*16. *Clemmys mutica.*
17. *Geoclemmys reevesi.*
18. *Ocadia sinensis.*
19. *Trionyx sinensis.*
20. *Gekko subpalmatus.*
21. *Hemidactylus bowringii.*
22. *Gonocephalus lepidogaster.*
23. *Ateuchosaurus chinensis.*
24. *Eumeces chinensis.*
25. *Natrix annularis.*
**26. *Natrix boulengeri.*
27. *Natrix percarinata.*
28. *Natrix piscator.*
29. *Natrix stolata.*
*30. *Opisthotropis maxwelli.*
31. *Ptyas korros.*
32. *Ptyas mucosus.*
33. *Eurypholus major.*
34. *Holarchus violaceus.*
35. *Enhydris chinensis.*
36. *Boiga multomaculata.*
37. *Bungarus multicinctus.*
38. *Naja naja atra.*
39. *Amblycephalus kuangtungensis.*
40. *Trimeresurus albolabris.*

SPECIES COLLECTED IN FUKIEN PROVINCE

[Single asterisks are new provincial records.]

1. *Bufo melanostictus.*
2. *Hyla chinensis.*
3. *Rana adenopleura.*
4. *Rana guentheri.*
5. *Rana japonica.*
6. *Rana limnocharis.*
*7. *Rana livida.*
8. *Rana tigerina rugulosa.*
9. *Rana schmackeri.*
10. *Rana spinosa.*
11. *Rana taipehensis.*
12. *Œidozyga lima.*
13. *Rhacophorus dennysi.*
14. *Rhacophorus leucomystax.*
15. *Microhyla pulchra.*
16. *Microhyla ornata.*
17. *Microhyla heymonsi.*
18. *Clemmys bealei.*
19. *Trionyx sinensis.*
20. *Gonocephalus lepidogaster.*
21. *Eumeces chinensis.*
22. *Sphenomorphus indicus.*
23. *Natrix percarinata.*
24. *Natrix piscator.*
25. *Natrix sauteri.*
26. *Natrix stolata.*
27. *Eurypholus major.*
28. *Opisthotropis maxwelli.*
29. *Enhydris chinensis.*
30. *Enhydris plumbea.*
31. *Boiga multomaculata.*
32. *Trimeresurus albolabris.*

ALTITUDINAL LISTS OF SPECIES

AT ALTITUDES UNDER 100 METERS

Bufo melanostictus.
Rhacophorus leucomystax.
Kaloula pulchra.
Cyclemys trifasciata.
Clemmys mutica.
Geoclemys reevesi.
Ocadia sinensis.
Ateuchosaurus chinensis.
Ptyas mucosus.
Naja naja atra.
Boiga multomaculata.

AT ALTITUDES FROM 175 TO 500 METERS

Bufo melanostictus.
Hyla chinensis.
Rana guentheri.
Rana limnocharis.
Rana tigerina rugulosa.
Rana taipehensis.
Œidozyga lima.
Rhacophorus leucomystax.
Microhyla ornata.
Microhyla pulchra.
Trionyx sinensis.
Clemmys bealei.
Hemidactylus bowringii.
Eumeces chinensis.
Gonocephalus lepidogaster.
Natrix æquifasciata.
Natrix percarinata.
Natrix piscator.
Natrix sauteri.
Calamaria septentrionalis.
Ptyas korros.
Ptyas mucosus.
Enhydris chinensis.
Enhydris plumbea.
Naja naja atra.
Boiga multomaculata.
Bungarus multicinctus.
Trimeresurus albolabris.

AT ALTITUDES FROM 540 TO 860 METERS

Triturus orientalis.
Bufo melanostictus.
Hyla chinensis.
Rana adenopleura.
Rana fukiensis.
Rana guentheri.
Rana japonica.
Rana kuhlii.
Rana latouchii.
Rana limnocharis.
Rana livida.
Rana nigromaculata.
Rana reinhardti.
Rana schmackeri.
Rana spinosa.
Staurois ricketti.
Rhacophorus dennysi.
Rhacophorus leucomystax.
Microhyla heymonsi.
Microhyla ornata.
Trionyx sinensis.
Platysternon megacephalum.
Gekko subpalmatus.
Hemidactylus bowringii.
Gonocephalus lepidogaster.
Sphenomorphus indicus.
Eumeces chinensis.
Natrix æquifasciata.
Natrix annularis.
Natrix boulengeri.
Natrix percarinata.
Natrix piscator.
Natrix stolata.
Opisthotropis maxwelli.
Opisthotropis latouchii.
Ptyas korros.
Eurypholus major.
Zaocys dhumnades montanus.
Holarchus formosanus.
Holarchus violaceus.
Enhydris chinensis.
Enhydris plumbea.
Trimeresurus albolabris.
Trimeresurus mucrosquamatus.
Bungarus multicinctus.
Amblycephalus kuangtungensis.

AT ALTITUDES ABOVE 860 METERS

Hyla chinensis.
Rana japonica.
Rana latouchii.
Rana limnocharis.
Rana spinosa.
Staurois ricketti.
Microhyla butleri.
Microhyla heymonsi.
Sphenomorphus indicus.
Pseudoxenodon bambusicola.
Eurypholus major.
Natrix percarinata.
Trimeresurus mucrosquamatus.

AMPHIBIA

CAUDATA

MUTABILLIA

SALAMANDRIDÆ

1. PACHYTRITON BREVIPES (Sauvage).

Triton brevipes SAUVAGE, Bull. Soc. Philop. Paris (7) 1 (1877) 177.

Ninety-four specimens (Nos. 22416 to 22506, 24314 to 24336, M. V. Z.) were taken at Tai-yong, altitude 640 meters, eastern Kwangtung Province, August 4, 1936. The specimens were probably caught in pools connected with a small stream in the valley.

Description.—Head 3.25 times in length from snout to vent, dorsoventrally compressed, rounded anteriorly; snout subtransverse apically, projecting, canthus rostralis fairly prominent; loreal region strongly oblique; upper lip with a flap of skin extending over corner of mouth; eye small, slightly oblique, shorter than its distance from nostril, or distance between nostrils; parotoids poorly developed, terminated posteriorly by a slightly sinuous and oblique groove; dorsal surface of head smooth, flat, slightly concave, with a posteriorly pointing, slightly raised V behind middle, its apex joining vertebral line, which is slightly concave, becoming raised before base of tail. Vomerine teeth commencing in a line with anterior border of choanæ, anteriorly forming a single, fine ridge, forking slightly before middle, forming a narrow, inverted Y. Tongue with apical portion short. much narrower than mouth cavity. Limbs small, anterior pair slightly longer than, and only half as thick as, hind pair, digits slender, gradually attenuated and acute apically; fingers 3—2—4—1, and toes 3—4—2—1, in decreasing order of length; toes webbed for basal fifth. Tail nearly as long as head and body length, with moderate dorsal and ventral fins, margins parallel basally, narrowing apically to an acute tip. Cloacal lips thick and strongly swollen, longer than depth of tail, separated posteriorly, where margins are finely grooved transversely. Skin smooth, extremely fine granules or vermiculations dorsally, microporous ventrally; sides almost without wrinkles, about fourteen indistinct costal grooves discernible on upper parts; gula and throat almost without longitudinal or transverse grooves. Dark brown to blackish, with bright orange below as follows: four large irregular blotches on gula, an irregular, moderately broad, median longitudinal stripe on belly, on each side of which is a row of irregular blotches, some connected with the stripe; undersides of arms and legs with a spot near base and another near palm; lips of vent largely orange, black posteriorly. Tail bright red-orange on basal three-fourths of ventral fin, entire apical half becoming pale orange-brown, more orange on both fins, spotted and blotched with black.

Measurements of 25 males and 25 females, in millimeters.

Measurement.	Males.			Females.		
	Smallest.	Largest.	Average.	Smallest.	Largest.	Average.
Total length	71.0	87.0	74.30	81.0	101.0	84.40
Snout to anterior end of vent	38.0	43.0	42.00	43.0	55.0	47.80
Tail (from leg insertion)	34.0	45.0	37.60	40.0	48.0	46.60
Head breadth at mouth corner	9.0	11.0	10.30	10.5	12.8	11.40
Distance between limbs at side	21.0	26.0	22.30	24.0	29.0	26.80
Interocular distance	3.6	4.0	4.40	4.0	5.5	4.48
Nostril to eye	3.0	3.4	3.19	3.0	3.5	3.20
Forelimb length	15.0	16.0	15.40	15.0	17.0	16.20
Hind limb length	14.0	16.0	16.00	16.0	16.5	15.88
Tail depth at base	6.0	7.0	7.00	6.0	8.0	6.80
Length of cloacal lips	6.5	7.0	7.00	5.0	4.5	5.30

Stomach contents.—Stomachs of 25 specimens contained the following: 5 earthworms, 4 amphipod crustaceans, 3 mites, 3 lepidopterous or trichopterous larvæ, 4 other insect larvæ, 2 spiders, 2 terrestrial and 4 aquatic hemipterans, 1 small water beetle (Dytiscidæ), 1 carrion beetle (*Hister*), termites (2 stomachs), 1 centipede, 1 amphibian (?) egg, 1 reptile egg, 1 nematode parasite, 1 snail, 2 ants, and some plant material.

Distribution.—Fukien; Kiangsi; Kwangtung; Hunan; Yunnan; Tonkin.

SALIENTIA

LINGUATA

BUFONIDÆ

2. BUFO MELANOSTICTUS Schneider.

Bufo melanostictus SCHNEIDER, Hist. Amphib. 1 (1799) 216, eastern India.

Thirty-one specimens (Nos. 22525 to 22555, M. V. Z.) were taken: eastern Kwangtung Province, 19 from Tsin-leong San, altitude 850 meters, June 1 to 5; 4 from Mei-hsien city, altitude 185 meters, May 30 and 31, June 8 and 9; 1 from Kakchieh, Swatow, altitude 75 meters, May 25: southeastern Kiangsi Province, 3 from Hong San, altitude 600 to 800 meters, June 22 and July 17; 1 from Tai-au-hong, altitude 450 meters, July 6; southwestern Fukien Province, 1 from Liung-chon San, altitude 800 meters, July 25; 2 from Gang-keu, altitude 450 meters, July 22 to 26.

Description.—Head much broader than long; snout short, a vertical ridge in front, dividing between nostrils and extending along canthi rostrali and inner borders of orbits to parotids, above tympana; eyes longer than snout; tympanum vertically oval. Fingers wide, blunt, tuberculate; hind limbs with tibiotarsal articulations only reaching axillæ; heels not overlapping when hind limbs are folded at right angles to body, toes blunt, two-thirds webbed. Skin rough and closely tuberculate, largest tubercles along either side of back. Dirty brown above with tubercles mainly black; ventral surface dirty yellow mottled with blackish; tips of toes and fingers black.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout length.	Head width.	Tympanum height.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
22553	female....	86	8.0	34	5.6	50	107	28	31.0	Tsin-leong.
22537	...do.....	84	6.0	29	5.0	46	96	29	29.0	Mei-hsien.
22545	...do.....	82	7.0	30	5.6	41	94	27	26.0	Tsin-leong.
22528	...do.....	78	7.0	26	5.6	41	88	25	27.0	Hong San.
22555	....	71	7.0	28	6.0	41	89	26	27.0	Swatow.
22530	male.....	69	7.0	28	4.7	40	83	25	27.0	Gang-keu.
22529	...do.....	62	6.8	26	4.2	38	79	24	25.5	Liung-chon.
22547	...do.....	47	5.0	18	3.5	28	55	16	16.0	Tsin-leong.

Stomach contents (contents of 22 stomachs are listed separately; number in parentheses refers to number of individuals found).—Vegetable material, weevils (6), lampyrid larva, ants, caterpillar, Hemiptera, miscellaneous beetles. Mollusc, ant. Termites (125), tettigoniid. Ants (8), myriapods (6), longicorn beetles (*Philus pallescens*). Cockroaches. Ants, weevils, other beetles. Centipede, tenebrionid beetle. Ants, beetle, larvæ. Ants, scarab beetles (*Onthophagus*) (3), elaterid, tenebrionid. Ants, weevil. Ants, scarab, cicindelid, mutillid, cercopid. Weevils (6), scarab (*Anomala*), lampyrid larva, miscellaneous beetles, ants, hemipterans, caterpillar. Ants, beetles, cockroaches, rice grain, coniferous needle. Cricket, cockroach, vegetable material. Tenebrionids (3), grass. Ants, isopods (2), lampyrid larva, telephorid (?) larva. Bees (2), shrimps, isopod, scarab, weevil. Ants, myriapods, scarab, carabid. Myriapod. Weevil, longicorn and another beetle, ants, myriapod. Honey bees (2).

Distribution.—Chekiang; Fukien; Kiangsi; Kwangtung; Yunnan; Hongkong; Hainan Island; India; Ceylon; Peninsula of southeastern Asia; Sunda Islands; Philippines.

Local Hakka name.—*Sham-chu-(lo).*

English name.—Indian toad.

HYLIDÆ

3. HYLA CHINENSIS Guenther.

Hyla arborea var. *chinensis* GUENTHER, Cat. Batr. Sal. Brit. Mus. (1858) 108, pl. 9, fig. C.

Fifty-five specimens (Nos. 22589 to 22612, 22617 to 22647, M. V. Z.) were collected; eastern Kwangtung Province, 9 at Yim-na San, altitude 600 meters, June 12 to 16; 2 at Tai-yong, altitude 650 meters, August 5: southeastern Kiangsi Province, 15 at Hong San, altitude 650 to 1,000 meters, June 25 to 30; 1 at Tai-au-hong, altitude 550 meters, July 5; 8 at Wong-sa-shue, altitude 600 meters, July 9 to 11: southwestern Fukien Province, 7 at Liung-chon San, altitude 780 meters, July 20; 13 at Gangkeu, altitude 450 to 550 meters, July 22 to 28.

Description.—Tongue entire behind, upper jaw toothed. Head a little broader than long; snout short, subtruncate; nostrils much closer to tip of snout than to eyes, tympanum less than one-half as long as eye, separated from latter by a distance equal to its diameter. Fingers flattened-cylindrical, webbed basally, expanded apically into transversely oval discs fully twice as wide as penultimate segments; toes flattened, one-half webbed, their discs not quite as large as those of fingers. Skin smooth above; ventral surface with coarse, low granules. Bright grass-green above, white beneath; front and sides of snout and a black-edged band on each side from eye to neck brown; sides of body, front edges of femora, and posterior sides of femora and tibiæ white with distinct black spots or blotches.

Stomach contents (number in parentheses refers to number of stomachs contained in).—Ants (25), miscellaneous beetles (3), larvæ (4), elaterid beetles (3), carabid beetle (1), cistellid (1), buprestid (1), weevil (1), pentatomid bug (2), culicid (1), and melyrid (1).

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout length.	Head width.	Tympanum diameter.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
22589	female	40.0	3.5	12.0	1.5	19.0	53.0	13	11.5	Hong San.
22635	do	38.0	3.0	13.0	1.5	22.0	54.0	17	15.0	Gang-keu.
22626	do	36.0	3.0	12.0	1.5	21.0	55.0	17	15.0	Do.
22645	do	35.0	2.6	11.0	1.5	19.0	51.0	16	13.0	Yim-na San.
22598	do	34.0	3.0	12.0	1.7	20.0	51.0	15	13.5	Hong San.
22594	male	30.0	3.0	11.0	1.2	12.0	44.0	13	11.5	Do.
22640	do	28.0	2.8	11.0	1.2	17.0	47.0	16	12.0	Yim-na San.
22641	do	22.0	2.4	9.5	1.0	16.0	43.0	13	11.0	Do.
22609	female	19.5	1.8	7.0	0.9	11.0	29.0	9	7.0	Wong-sa-shue.
22601	juvenile	15.0	1.6	5.0	5.0	7.5	20.5	6	5.0	Hong San.

Distribution.—Shensi; Kiangsu; Chekiang; Fukien; Kiangsi; Kwangtung; Hunan; Yunnan; Szechwan; Hainan Island; Formosa.

Local Hakka name.—Yi Kwai.

English Name.—Chinese green tree frog.

RANIDÆ

4. RANA ADENOPLEURA Boulenger.

Rana adenopleura BOULENGER, Ann. Mag. Nat. Hist. (8) 4 (1909) 492, Fuhosho, Formosa.

Eight specimens (Nos. 22662 to 22669, M. V. Z.) were collected: 7 in southeastern Kiangsi Province, Hong San, altitude 700 to 850 meters, June 28 to 30, July 15 to 17: 1 in southwestern Fukien Province, Liung-chon San, altitude 700 meters, July 21, 1936.

New to Kiangsi Province.

Description.—Head longer than broad; snout broad, obtuse at tip, projecting; nostrils lateral, equidistant from eye and tip of snout; canthus rostralis fairly distinct; loreal region weakly concave; eye three-fourths as long as its distance from tip of snout; tympanum round, its diameter 0.75 length of eye. Vomerine teeth short, suboblique, between internal nares. Forelimbs moderately slender; fingers slender, hardly webbed, flattened and slightly expanded distally, bearing distinct subarticular tubercles, first finger barely longer than second and shorter than fourth. Hind limbs moderately slender; tibiotarsal articulation reaching, or nearly reaching, tip of snout; toes three-fourths webbed, slightly expanded and subacute at tips, with small, but prominent subarticular tubercles; inner metatarsal tubercle distinct and narrow, outer metatarsal tubercle feeble and rounded.

Skin finely tuberculate on dorsal surface of body and hind limbs, smooth beneath, wrinkled and irregularly tuberculate at sides below the moderately distinct dorsolateral folds. Males with a large triangular swollen area on each side behind forelimb. Dull brown above, with a midlongitudinal pale stripe of varying width; upper lip white above; ventral surface white, or partly speckled with brown; chin brownish in male; hind limbs banded with black.

Measurements in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout length.	Head width.	Tympanum diameter.	Forelimb.	Hind limb.	Tibia.	Fourth toe.	Locality.
22665	female	50	6.0	16.0	4.0	27	92	27	28.0	Hong San.
22668	male	47	5.5	15.0	4.4	22	72	21	21.5	Do.
22667	female	46	5.5	15.0	3.3	23	76	23	23.5	Do.
22664	do	43	6.0	14.0	3.5	26	80	24	25.0	Do.
22666	do	43	5.2	13.0	3.4	23	74	22	23.0	Do.
22662	male	41	6.0	14.5	3.0	22	73	21	24.0	Do.
22669	do	41	6.0	15.0	3.0	25	72	22	23.0	Liung-chon.
22663	do	31	4.0	11.0	2.5	17	57	16	17.5	Hong San.

Stomach contents (*number in parentheses refers to number of stomachs contained in*).—Ants (6), caterpillars (2), pentatomids (2), other hemipterans (1), gryllotalpid (1), elaterid (1), chrysomelid larva (1).

Distribution.—Fukien; Kiangsi; Formosa.

5. RANA FUKIENSIS Pope.

Rana fukiensis POPE, Amer. Mus. Novitat. 352 (1929) 4, pl. 4, Futsing-hsien, Fukien.

Five specimens (Nos. 22681 to 22685, M. V. Z.) were collected in southeastern Kiangsi Province, Hong San, altitude 650 meters, June 22 and 23, 1936.

New to Kiangsi Province.

Description.—Head a little longer than broad, snout wide, bluntly rounded apically, nostrils slightly closer to tip of snout than to eye, canthus rostralis rounded, not very distinct, eye slightly longer than its distance from nostril; tympanum large, round, nearly as large as eye. Forelimbs fairly short and stout; fingers feebly swollen at tips, webbed only at extreme bases, first finger longer than second, subequal to fourth; subarticular tubercles moderately distinct; hind limbs large, tibiotarsal articulation reaching a little beyond eye; toes almost completely webbed, feebly swollen at tips, subarticular tubercles small; inner metatarsal tubercles prominent, laterally compressed. Skin fairly smooth, slightly wrinkled at sides, below the distinct dorsolateral fold; vent region weakly tuberculate. Putty-gray to brown above, white below; thighs brown above and behind, spotted with white.

Measurements in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout length.	Head width.	Tympanum diameter.	Forelimb.	Hind limb.	Tibia.	Fourth toe.
22685	female	78	11	26	6.0	38	123	34	41
22684	do	53	8	19	4.5	23	86	24	28
22682	male	48	7	17	3.7	25	78	21	26
22681	female	45	7	16	4.0	23	76	20	25
22683	do	44	7	15	3.5	22	70	19	23

Stomach contents.—Elaterid, 3 curculionids, melolonthid and *Serica*-like beetles; acridiid; tettigid; damsel fly; dragonfly nymph; belostomatid nymph; myriapod; spider.

Ovaries.—No. 22685 contained eggs a little less than one millimeter in diameter.

Distribution.—Fukien; Kiangsi; Formosa.

6. RANA GUENTHERI Boulenger.

Rana guentheri BOULENGER, Cat. Batr. Sal. Brit. Mus. (1882) 48, pl. 4, Amoy.

Seventy-three specimens (Nos. 22688 to 22699, 22702, 22704 to 22757, 22759 to 22762, 23115, 23116, M. V. Z.) were collected: eastern Kwangtung Province, 2 at Mei-hsien city, altitude 200 meters, May 30 and June 18; 3 at Tai-yong, altitude 650 meters, August 5 and 6: southeastern Kiangsi Province, 36 at Hong San, 650 to 840 meters, June 21 to 29, July 14 to 17; 3 at Tai-an-hong, July 4 to 6; 1 at Sungwu, altitude 500 meters, July 13; 3 at Wong-sa-shue, July 9 to 11; southwestern Fukien Province, 24 at Gang-keu, altitude 420 meters, July 22 to 28; 1 at Liungchon San, altitude 780 meters, July 22.

Description.—Head longer than broad; snout a little broader than long, rounded apically; nostrils closer to tip of snout than to eyes; canthus rostralis prominent; orbit three-fourths as long as snout; tympanum three-fourths as long as eye, finger narrow, blunt apically, first finger about as long as third; tibiotarsal articulation reaching to between eye and tip of snout; toes about three-fourths webbed, very slightly expanded apically. Skin smooth; dorsolateral fold distinct. Brown above, blackish brown at sides; tympana and sides of body reddish brown; upper lip palish, lower lip spotted with black; arms pinkish brown, spotted and vermiculated with blackish brown on femora, banded on tibiæ and feet.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout length.	Head width.	Tympanum diameter.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
22735	female	86	11.5	25.0	5.8	46	129	39	38.0	Gang-keu.
23115	male	76	11.0	24.0	6.0	36	115	35	35.0	Hong San.
22760	female	71	12.0	22.0	5.0	40	124	37	37.0	Tai-yong.
23116	male	68	11.0	23.0	5.0	36	110	33	33.0	Hong San.
22730	female	65	9.0	22.0	5.0	38	114	34	33.0	Wong-sa-shue.
22729	do	54	8.0	18.0	4.0	32	99	29	31.0	Do.
22731	do	41	6.0	13.5	3.0	25	81	25	24.5	Tai-au-hong.
22726	do	28	4.5	8.0	2.0	15	43	14	13.0	Wong-sa-shue.
22750	juvenile	19	3.0	6.5	1.5	9	28	8	8.0	Gang-keu.

Stomach contents (number in parentheses refers to number of stomachs contained in).—Gryllids (4); rhaphidophorid (1); tettigoniids (2); acridiids (4); tettigids (2); gryllotalpids (2), caterpillars (4); larvæ, pupæ, and adults of calliphorids (1); elaterids (2); melolonthid (1); other scarabæids (3); tenebrionid (1); histerid (1); other beetle (1); tipulid (1); odonatan (1); neuropteroid larva (1); other larva (1); centipede (1).

Distribution.—Chekiang; Fukien; Kiangsi, Kwangtung; Kwangsi; Szechwan; Kiangsu; Yunnan; Hongkong; Hainan Island; Formosa; Tonkin; Annam.

7. RANA JAPONICA (Schlegel).

Rana temporaria var. *japonica* SCHLEGEL, Fauna Japonica rept. (1838) 109, 193, pl. 3, fig. 2, Japan.

Fourteen specimens (Nos. 22758, 22773 to 22785, M. V. Z.) are in the collection: southeastern Kiangsi Province, 6 from Hong San, altitude 800 to 980 meters, June 27 to 30; 1 from Wong-sa-shue, altitude 800 meters, July 10: southwestern Fukien Province, 1 from Liung-chon San, altitude 800 meters, July 22; 4 from Gang-keu, altitude 850 meters, July 23 and 24: eastern Kwangtung Province, 1 from Tsin-leong San, altitude 850 meters, June 7, 1936.

Description.—Long and narrow; head longer than broad; snout a little broader than long, rounded; nostrils a little closer to tip of snout than to eyes; eyes nearly as long as snout; tympanum round, 0.6 as long as eye. Limbs slender; fingers feebly swollen apically, third finger much longer than fourth; toes slender, about three-fifths webbed, tips barely swollen; subarticular tubercles small but distinct; inner metatarsal tubercles short and prominent. Skin smooth; a narrow, but distinct, dorsolateral fold on body. Grayish to reddish brown, with irregular spots or streaks of darker on back; sides of snout and a wide oblique band across side of head behind eye and covering tympanum, dark brown; lips and sides of body finely spotted or mottled with dark brown; limbs banded with many brown bands; ventral surface pale and partly speckled.

Measurements of selected specimens, in millimeters.

M. C. Z. No.	Sex.	Total length.	Snout length.	Head width.	Tympanum diameter.	Forelimb.	Hind limb.	Tibia.	Fourth toe.	Locality.
22784	female....	52	7.0	14	3.5	28	102	31	31	Gang-keu.
22778	...do.....	50	6.0	14	3.0	28	101	31	30	Hong San.
22783	...do.....	49	6.5	14	2.8	27	92	29	28	Gang-keu.
22777	...do.....	47	7.0	15	3.0	31	102	31	31	Hong San.
22779	male.....	45	6.0	13	2.5	26	91	28	27	Do.
22785	...do.....	39	6.0	12	2.5	23	81	24	23	Gang-keu.
22773	...do.....	37	5.5	10	2.0	22	69	21	21	Hong San.
22775	...do.....	25	3.5	7	1.4	14	44	14	12	Do.

Stomach contents (*number in parentheses refers to number of stomachs contained in*).—Gryllid; tettigid; orthopteran nymph; cicindelid; cistellid; elaterid; larvæ (2); ants (2); centipede.

Distribution.—Japan; Formosa; Hupeh; Hunan; Anhwei; Kiangsu; Kiangsi; Fukien; Kwangtung; Yunnan; Szechwan.

Possibly this form should be called *Rana japonica longicrus*, but the specimens are very close to those from Japan, and material from central China has been considered identical with Japanese material.

8. RANA KUHLII Dumeril and Bibron.

Rana kuhlii DUMERIL and BIBRON, Erp. Gen. 8 (1841) 384, Java.

A single male specimen (No. 22786, M. V. Z.) was taken in southeastern Kiangsi Province, at Tai-au-hong, altitude 550 meters, July 6, 1936.

New to Kiangsi Province.

Description.—Head fully as broad as long; snout broad, bluntly rounded; nostrils equidistant from eyes and tip of snout; canthus rostralis obtuse; eye three-fourths as long as its distance from tip of snout; tympanum not distinct externally. Forelimbs short, stout; first finger slightly shorter than second, both much shorter than third, subarticular tubercles fairly distinct, tips of fingers rounded; hind limbs with tibiotarsal articulations reaching eye; toes slender, three-fourths webbed, with very small discs at tips; outer metatarsal tubercle indistinct; subarticular tubercles small. Skin smooth, a few wrinkles at sides and some insignificant tubercles near vent. Dark putty-gray above, marked with brownish black as follows: four bands radiating from eye to snout, lips and tympanal region, a broad band between eyes, some irregular streaks and spots along sides and transverse bands across limbs; ventral surfaces white, slightly grayish on throat, lower lips spotted with blackish brown.

Measurements, in millimeters.—Snout to vent, 46; length of snout, 6; width of head, 19; forelimb, 22.5; hind limb, 65; tibia, 20; fourth toe, 22.

Distribution.—South China, Fukien, Kiangsi, Kwangtung; Hainan Island; Ryu-kiu (Loochoo) Islands; Formosa; Siam; Malay Peninsula; Sunda Islands; Celebes.

9. RANA LATOUCHII Boulenger.

Rana latouchii BOULENGER, Proc. Zool. Soc. London (1899) 167, pl. 19, fig. 1, Kuatun, Fukien.

Two specimens (Nos. 22787 to 22788, M. V. Z.) were collected in southeastern Kiangsi Province, Hong San, altitude 750 to 1,000 meters, June 30, 1936, along trails in damp forest.

New to Kiangsi Province.

Description.—Head a little longer than broad; snout bluntly rounded; nostrils slightly closer to tip of snout than to eyes; canthus rostralis moderately prominent; eyes slightly shorter than snout; tympanum two-thirds as long as eye. Forelimbs fairly long and slender; fingers slender, slightly expanded at tips, bearing prominent subarticular tubercles; hind limbs slender, tibiotarsal articulation reaching tip of snout, toes slender, two-thirds webbed, slightly expanded at tips; subarticular tubercles and outer metatarsal tubercles small but distinct. Skin densely granulate above, except on frontal region, fairly smooth beneath; dorsolateral fold distinct. Color mottled dark brown and pale gray, pinkish along dorsolateral fold, legs banded with black and tan; ventral surface pale, mottled with dark; lips white, mottled with dark brown.

Measurements in millimeters [*adult male and juvenile male* (?), *respectively*].—Snout to vent, 33, 18; length of snout, 4.5, 2.5; width of head, 11.5, 5.5; length of orbit, 4, 2; diameter of tympanum, 2.3, 1; length of forelimb, 20.5, 8.5; hind limb, 57, 25.5; tibia, 18, 8; fourth toe, 17, 7.

Stomach contents.—Otyorhynchid weevil; proctotrypid (?) wasp; chrysomelid beetle; acridiid nymph.

Distribution.—Fukien; Kiangsi, Formosa.

10. RANA LIMNOCHARIS Gravenhorst.

Rana limnocharis GRAVENHORST, Polic. Mus. Zool. Vratislav 1 (1829) 42.

One hundred thirty-four specimens (Nos. 22892 to 23025, M. V. Z.) represent this species: eastern Kwangtung Province, 57 from Tsin-leong San, altitude 830 meters, June 2 and 3; 13 from Yim-na San, altitude 550 meters, June 11 to 16; 11 at Meihsien city, altitude 180 meters, May 30 and 31, June 9; 2 at Taiyong, altitude 650 meters, August 3 to 5: southeastern Kiangsi Province, 43 at Hong San, altitude 650 to 900 meters, June 21 to 29, July 15 and 16; 4 at Tai-au-hong, altitude 550 meters, July 4 to 7; 1 at Wong-sa-shue, altitude 540 meters, July 9: southwestern Fukien Province, 2 at Liung-chon San, altitude 750 meters, July 22; 1 at Gang-keu, altitude 425 meters, July 24, 1936.

Description.—Body short; head nearly as broad as long; snout bluntly rounded; nostrils almost equidistant from eyes and tip of snout; lores oblique; orbits a little shorter than snout; tympanum one-half as long as orbit. Limbs short; fingers tapering, blunt apically; tibiotarsal articulations of hind limbs reaching tympanum or eye; toes about one-half webbed, tapering, nearly pointed apically. Skin smooth beneath; back with irregular rows of short, longitudinal ridges. Color variable, generally gray or brown above with irregular black spots or bars, and a light vertebral line from tip of snout to vent; lips pale, spotted with black; ventral surface white, sides of throat black in male.

Measurements of selected specimens from Tsin-leong San, in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout length.	Head width.	Tympanum diameter.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.
23022	female	45	5.0	14	1.5	20	58	17	18
22986	do	39	6.5	13	1.8	18	57	16	18
22988	do	36	5.6	13	1.8	17	56	16	18
22987	male	33	5.0	11	2.0	18	46	13	15
22982	do	29	4.5	11	1.5	15	44	12	14

Stomach contents (number in parentheses refers to number of stomachs contained in).—Gryllids (1); caterpillars (3); ants (2); spiders (1); lepidopterous pupa (1); moth (1).

Distribution.—Shantung; Hupeh; Anhwei; Kiangsu; Kiangsi; Fukien; Kwangtung; Kwangsi; Hunan; Yunnan; Szechwan; Hongkong; Hainan Island; Formosa; Ryu-kyu (Loochoo) Islands; Peninsula of southeastern Asia; Sunda Islands; Philippines; India.

Local Hakka name.—Si Kwai.

English name.—Paddy frog.

11. RANA LIVIDA (Blyth).

Polypedates lividus BLYTH, Journ. As. Soc. Beng. 24 (1855) 718, Darjeeling.

Ten female specimens (Nos. 23026 to 23035, M. V. Z.) were taken in southwestern Fukien Province, Gang-keu, south of Shanghang, altitude 600 meters, July 24, 1936, from a small cascading stream in a forested canyon.

New to Fukien Province.

Description.—Head longer than broad; snout rounded; nostrils more widely separated than orbits, slightly closer to tip of snout than to eyes; lores concave; eyes about three-fourths as long as snout; diameter of tympanum barely as great as one-half length of eye. Forelimbs moderately stout; fingers feebly margined laterally, bearing large, subacute, laterally grooved discs at tips and large subarticular tubercles below; hind limbs with tibiotarsal articulations reaching or slightly exceeding tip of snout; toes webbed to discs, the latter similar to those of fingers, subarticular tubercles prominent; outer metatarsal tubercle lacking. Skin fairly smooth, slightly wrinkled above, at side, and on backs of thighs. Grass-green, with a few small brown spots on back between dorsolateral folds; sides and limbs brown, latter banded with darker; ventral surface white.

Measurements of 10 females, in millimeters.

M. V. Z. No.	Total length.	Snout length.	Head width.	Tympanum diameter.	Forelimb.	Hind limb.	Tibia.	Fourth toe.
23027	103	14.0	33	5.5	62	183	61	51
23026	102	14.0	32	5.0	61	192	62	53
23032	101	14.0	33	6.0	55	181	62	51
23033	100	14.0	31	6.0	61	186	62	52
23035	99	14.0	32	5.0	62	185	60	53
23034	97	13.0	29	5.0	60	170	55	49
23031	97	13.0	31	5.0	56	176	57	50
23030	97	13.5	31	5.0	56	178	58	51
23028	96	13.0	31	5.5	59	179	59	50
23029	96	13.5	32	5.5	62	187	60	53

Stomach contents.—Plecopteran; pentatomid bug; *Cicada;* spider.

Distribution.—Eastern Himalayas; Assam; Tenasserim; Perak; Hongkong; Kwangtung; Fukien.

12. RANA NIGROMACULATA REINHARDTII (Peters).

Hoplobatrachus Reinhardtii PETERS, Monatsber. Kön. Preuss. Akad. Wiss. Berlin (1867) 711, Malacca or China.

Twenty-one specimens (Nos. 22687, 22700, 22701, 22703, 23037 to 23053, M. V. Z.) were taken in southeastern Kiangsi Province, Hong San, altitude 650 to 850 meters, June 21 to 24, July 15, 1936.

Description.—Head longer than broad; snout subacutely rounded; nostrils slightly closer to eyes than to tip of snout; canthus rostralis obtuse; interorbital distance less than distance between nostrils; tympanum two-thirds as long as eye. Fingers attenuated apically, subarticular tubercles moderately distinct; hind limbs with tibiotarsal articulations reaching to nostrils; toes almost completely webbed, their tips slender and rounded, subarticular tubercles small but distinct; inner metatarsal tubercle minute, outer metatarsal tubercle sharp and prominent. Skin wrinkled above, smooth below, dorsolateral folds distinctly raised. Males with external vocal sacs on sides of throat. Grayish brown spotted with black above, white beneath; hind limbs banded with dark brown and white anteriorly and posteriorly.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Tympanum diameter.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.
23046	female	81	12	27	6.0	44	133	40	44
23047	do	77	11	27	6.5	40	120	37	41
23044	male	70	11	27	6.5	33	116	33	39
23042	do	59	10	17	4.5	29	91	27	30
23049	do	67	9	20	4.0	30	95	25	31
23037	do	39	6	14	3.5	19	57	16	19
23039	do	34	5	11	2.2	16	51	14	16
23038	juvenile	26	4	9	2.0	14	41	11	14

Stomach contents (number in parentheses refers to number of stomachs contained in).—Ants (3); spiders (3); gryllids (3); acridiids (2); gryllotalpids (2); cockroach (*Blatella*) (1); cercopid (*Cosmocarta*) (1); vespid (*Polistes*) (1); scarabæids; melolonthids (4), sericines (2); *Anomala* (1); elaterid (1); chrysomelid (1); hymenopteran (1); dipteran and neuropteran larvæ (2); tadpole (?) (1); leaves (3).

Distribution.—Chekiang; Kiangsu; Anhwei; Hunan; Fukien; Kiangsi, Kwangtung; Szechwan.

13. RANA SCHMACKERI Boettger.

Rana schmackeri BOETTGER, Kat. Batr. Saml. Senck. Ges. (1892) 11, Ichang, Hupeh.

Ten specimens (Nos. 22671 to 22680, M. V. Z.) were taken: southwestern Fukien Province, 7 from Gang-keu, altitude 600 meters, July 24; southeastern Kiangsi Province, 3 from Hong San, altitude 700 meters, June 24 and July 16, 1936, in cascades of mountain streams.

New to Kiangsi Province.

Description.—Head slightly broader than long; snout broad and bluntly rounded; nostrils about equidistant from eyes and tip of snout; canthus rostralis short, rounded; eyes about as long as snout; tympanum nearly one-half as long as eye. Fingers long, feebly margined laterally, expanded apically into discs nearly twice as broad as penultimate segments; tibiotarsal articulation reaching to between eyes and tip of snout, or beyond latter, toes almost completely webbed, apical discs barely larger than those of fingers. Skin with low, coarse granules above, subtuberculate at sides and smooth beneath. Green above with many brown spots of varying size; ventral surface white except for four dark areas on each side of lower lip.

Measurements of 10 females, in millimeters.

M. V. Z. No.	Total length.	Snout length.	Head width.	Tympanum diameter.	Forelimb.	Hind limb.	Tibia.	Fourth toe.
22617	92	10.0	29	4.5	47	151	46	45
22675	87	10.6	29	4.5	52	161	47	48
22680	85	11.0	31	4.5	50	157	47	46
22672	85	12.0	31	4.5	49	153	50	45
22676	83	10.0	27	4.5	48	143	45	43
22673	82	11.0	31	5.0	46	155	47	43
22674	81	9.0	29	4.6	49	152	48	43
22678	81	10.0	28	4.0	50	165	48	43
22671	79	10.0	28	4.8	60	151	48	44
22679	69	9.5	25	4.2	39	137	42	40

Stomach contents (number in parentheses refers to number of stomachs contained in).—Beetles, cerambycids (*Astathes, Pterolophia, Dihammus?*) (3); melolonthid; scarabæid; chrysomelid (*Oides*); arboreal cicindelid; cistellid; beetle larva; *Cicada;* dragonfly; dipteran; spider; indeterminate arthropods.

Distribution.—Hupeh; Kiangsi; Fukien; Kwangtung; Hainan Island; Tonkin.

14. RANA TIGERINA RUGULOSA Wiegmann.

Rana rugulosa WIEGMANN, Nova Acta Leop.-Carol. 17 (1) (1835) 258, Cape Syngmore, China.

Sixteen specimens (Nos. 23059 to 23074, M. V. Z.) were taken: eastern Kwangtung Province, 14 from Tai-yong, altitude 640 meters, August 3 to 5: southwestern Fukien Province, 2 from Gang-keu, altitude 400 meters, July 23 to 26, 1936.

Description.—Heavy-bodied; head broad, oblique at sides and front; snout blunt; nostrils one-half way between tip of snout and eyes; tympanum diameter 0.75 of orbit. Arms stout; fingers and toes tapering, blunt, the latter completely webbed. Skin with longitudinal ridges of varying length, and tubercles, on back and legs. Dark brown, mottled or splotched with black; legs indistinctly banded; throat white with dark spots.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Tympanum diameter.	Forelimb.	Hind limb.	Tibia.	Fourth toe.
23061	female	107	16	44	8.0	56	165	46	52
23062	male	95	13	33	6.5	46	135	32	42
23071	female	76	10	29	5.5	36	112	31	35
23063	do	72	11	25	4.0	35	97	28	31
23060	do	62	10	24	4.5	29	87	25	28
23069	do	33	5	12	2.0	16	43	12	12

Stomach contents (number in parentheses refers to number of stomachs contained in).—5 *Rana limnocharis* (4); *Microhyla ornata* (1); weevils (2); melolonthid (1); *Onthophagus* (1); cicindelid (*Collyris*) (1); 3 carabids (2); elaterid (1); gryllid (2); tettigoniid (1); acridiid (1); gerrid (1); *Sphæroderma* (1) ichneumonid (1); larva (1); spider (1); myriapod (1); earthworm (1).

Distribution.—Anhwei; Kiangsu; Chekiang; Kiangsi; Fukien; Kwangtung; Hunan; Yunnan; Szechwan; Hainan Island; Hongkong; Formosa; Japan.

15. RANA SPINOSA David.

Rana spinosa DAVID, Journ. Trois Voy. Chinois 2 (1875) 253, northern Kiangsi.

Sixteen specimens (Nos. 23075 to 23089, 25322, M. V. Z.) were taken: southern Kiangsi Province, 8 from Hong San, altitude 750 meters, June 21 to 23; southwestern Fukien Province, 3 from Haba, altitude 500 meters, July 17; 3 from Gang-keu, altitude 600 meters, August 6, 1934.

Description (breeding male).—Broad; head as broad as shoulders, broader than long; snout more than twice as broad as long, blunt; nostrils more widely separated than orbits, closer to latter than to tip of snout; eyes nearly as long as their distance from tip of snout; tympanum indistinct; a fold from corner of eye to front of shoulder. Forelimb stout, nearly as thick as thigh; fingers tapering, bluntly rounded apically, first finger longer than second, bent, strongly swollen in middle and with a large swelling at base, latter and outer sides of first three fingers armed with acute, black, spiny tubercles. Toes completely webbed, apically swollen into subspherical discs, subarticular tubercles strongly swollen, inner metatarsal tubercle long and narrow, prominent, outer metatarsal tubercle lacking. Skin thick, wrinkled and irregularly tuberculate on back, in part with short ridges; chest with many large, briefly spined tubercles. Blackish brown above, yellowish white beneath with dark mottlings on lower lip, throat, and undersides of legs, tubercles on chest and fingers black-tipped. *Female.*—Forelimbs not greatly swollen; fingers and chest nontuberculate. No. 23080 contained eggs 3 to 4 millimeters in diameter (June 23).

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
23078	male	127	12.0	50	54	180	55	53	Hong San.
23085	do	122	13.0	50	60	182	55	52	Haba.
23079	do	114	11.5	50	53	181	54	52	Hong San.
23083	female	105	11.0	40	47	147	44	45	Gang-keu.
23077	male	95	11.0	37	44	156	45	42	Hong San.
23089	do	69	8.5	28	31	112	33	34	Tai-yong.
23088	female	65	8.0	27	34	114	32	34	Do.

Stomach contents (number in parentheses refers to number of stomachs contained in).—5 scarabæids (3); carabid (1); prionid (1); other beetles (2); blattid (1); tettigoniid (1); acridiid (1); gryllid (1); 2 rhaphidophorids (1); ants (3); myriapod (1); pentatomid (1); 2 crabs (1); indeterminable insects (2); vegetable material (3).

Distribution.—Hupeh; Chekiang; Kiangsi; Fukien; Kwangtung; Hongkong; Yunnan; Szechwan; Tonkin.

Local Hakka name.—*Shak-lun* (rock dragon).

English name.—Chinese edible frog.

16. RANA TAIPEHENSIS Van Denburgh.

Rana taipehensis VAN DENBURGH, Proc. Cal. Acad. Sci. (4) 3 (1909) 56, Taipeh, Formosa.

A single male specimen (No. 23103, M. V. Z.) was taken in southwestern Fukien Province, Gang-keu, altitude 420 meters, July 23, 1936.

Description.—Slender; head one and one-half as long as broad; snout nearly as long as broad, narrowly rounded apically, projecting; nostrils lateral, closer to tip of snout than to eyes; eyes two-thirds as long as snout; tympanum distinct and subtransparent, as long as eye. Limbs slender; fingers expanded apically into discs a little less than twice as wide as penultimate phalanges; hind limbs with tibiotarsal articulations reaching to nostrils; toes slightly more than one-half webbed, expanded apically into discs a little smaller than those of fingers. Skin fairly smooth. Light gray on upper part of body, more brownish at sides, with fine, narrow, longitudinal, silvery-white stripes, one median, one on each side along canthus rostralis, upper eyelid and dorsolateral fold, and another on each side along lower lip and lower side of body; legs tan above, feebly banded; ventral surfaces white.

Measurements.—Snout to vent, 21 mm; length of snout, 4; width of head, 8; diameter of tympanum, 3; length of arm, 14; leg, 44; tibia, 13; fourth toe, 14.

Stomach contents.—One spider.

Distribution.—Formosa; Hongkong; Hainan Island; Kwangtung; Fukien.

17. STAUROIS RICKETTI (Boulenger).

Rana ricketti BOULENGER, Proc. Zool. Soc. London (1899) 168, pl. 19, fig. 2, Kuatun, Fukien.

Fifteen specimens (Nos. 23117 to 23131, M. V. Z.) were collected in southeastern Kiangsi Province, Hong San, altitude 800 to 875 meters, July 15 to 17, 1936, among or on boulders in a small precipitous mountain stream.

New to Kiangsi Province.

Description.—Vomerine teeth strongly oblique, nearly uniting posteriorly. Body dorsoventrally compressed; head broader than long; snout short, broadly rounded, tip projecting beyond upper lip; nostrils equidistant from tip of snout and eyes; orbit longer than snout; tympanum barely one third diameter of orbit. Fingers narrow, apices expanded into discs nearly three times as wide as penultimate phalanges; hind limbs with tibiotarsal articulations reaching eye or nostril; toes five-sixths webbed; apical discs not quite as large as those of fingers. Skin finely and sparsely granulose above, smooth beneath. Black or blackish brown above, mottled with pale; ventral surface white, more or less mottled with dark on throat.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Tympanum diameter.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.
23130	female	67	7.0	21	2.2	33	91	28	27
23126	do	63	6.0	17	2.0	30	85	25	25
23117	do	51	6.0	19	2.0	33	90	28	24
23125	do	48	4.5	18	1.5	28	75	23	21
23131	do	47	5.5	16	1.7	27	73	23	21
23130		38	4.5	13	1.0	22	65	20	18

Stomach contents.—2 dascyllid beetles; 2 centipedes; myriapods; weevil; hemipteran; forficulid; heteroceran; tipulid; icheumonid; larva, spider; *Rana limnocharis* (?).

Distribution.—Fukien; Kiangsi; Kwangtung; Tonkin.

18. ŒIDOZYGA LIMA (Gravenhorst).

Rana lima GRAVENHORST, Delic. Mus. Zool. Vratislav 1 (1829) 41, Java.

Three specimens (Nos. 22659 to 22661, M. V. Z.) were collected in rice fields in southwestern Fukien Province, at Gang-keu, south of Shanghang, altitude 400 meters, July 26 to 28, 1936.

Description.—Head broader than long; snout short and blunt; nostrils dorsal, slightly closer to eyes than to tip of snout; interorbital space very narrow; eyes nearly as long as snout; tympanum hidden. Forelimbs short; fingers slender and pointed, their subarticular tubercles small; hind limbs large, tibiotarsal articulations reaching eye; toes slender, subacute, completely webbed, their tubercles on ventral surface larger and less acutely raised. Dusky white, with a dark streak on either side of throat; posterior face of thigh with a black stripe above and below with white.

Measurements in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head length.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.
22660	male	18.0	2.0	7.0	9.0	27	7.5	9.0
22661	do	17.0	2.0	6.5	9.0	26	7.0	9.5
22659		15.5	1.6	6.0	7.5	24	6.0	8.0

Stomach contents.—One spider; one collembolan (?).

Distribution.—Sunda Islands; peninsula of southeastern Asia; Hainan Island; Hongkong; Fukien; Kwangtung.

19. RHACOPHORUS DENNYSI (Blandford).

Rhacophorus dennysi (BLANDFORD), Proc. Zool. Soc. London (1881) 224, pl. 21, Singapore specimen brought from China.

Four specimens (Nos. 23134 to 23137, M. V. Z.) were collected: southeastern Kiangsi Province, 2 at Tai-au-hong, south of Sungwu, altitude 550 meters, July 6 and 7; 1 at Hong San, northeast of Sungwu, altitude 840 meters, July 15: southwestern Fukien Province, 1 at Kwa-tze-piang, between Haba and Wuping, altitude 560 meters, July 18, 1936.

Description.—Head large, broader than long; snout broad, obtusely rounded; nostrils a little closer to end of snout than to eyes; eyes two-thirds as long as snout; tympanum three-fifths as long as eye, forelimbs large; fingers broad, one-third to three-fourths webbed, expanded into large discs wider than tympanum at tips, subarticular tubercles large; toes expanded, completely webbed, apical discs about two-thirds as wide as those of fingers. Skin smooth or feebly tuberculate above, reticulate-granulose beneath. Bright green above with a few asymmetrically placed, rounded, brown splotches of varying size on top of head and anterior portion of back; sides of body with irregular spots; limbs with external stripes of silvery white, distinctly edged with green, brown, or black; ventral surfaces whitish.

Measurements in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Tympanum diameter.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
23134	female	115	13	6.0	67	165	51	46	Tai-au-hong.
21137	do	90	12	6.0	63	147	43	44	Kwa-tze-piang.
23135	do	80	9	5.0	51	125	40	35	Tai-au-hong.
23136	juvenile	31	3	1.3	17	44	14	12	Hong San.

Stomach contents (number in parentheses refers to number of stomachs).—Caterpillars (2); cicada (*Platypleura*); phasmid; weevil; arboreal tenebrionid; isopod (?); bird feather.

Distribution.—Fukien; Kiangsi; Kwangtung; Kwangsi.

Local Hakka name.—*Chang Kwai.*

20. RHACOPHORUS LEUCOMYSTAX (Gravenhorst).

Hyla leucomystax GRAVENHORST, Delic. Mus. Vratislav (1829) 26, Java.

Twenty-one specimens (Nos. 23148 to 23168, M. V. Z.) are in the collection: eastern Kwangtung Province, 1 from Tsin-leong San, altitude 850 meters, June 6; 3 from Yim-na San, altitude 500 meters, June 10 to 15, 3 from Tai-yong, altitude 650 meters, August 3: southeastern Kiangsi Province, 2 from Tai-au-hong, altitude 550 meters, July 4; 1 from Wong-sa-shue, altitude 750 meters, July 11; southeastern Fukien Province, 3 from Liungchon San, altitude 760 meters, July 21; 8 from Gang-keu, altitude 550 meters, July 23 to 28, 1936.

New to Kiangsi Province.

Description.—Head practically as broad as long; snout much broader than long, rounded apically, subacute in males; nostrils much closer to tip of snout than to eyes; eyes three-fourths as long as snout; tympanum five-eighths as long as eye in female, one-half as long in male. Fingers dorsoventrally compressed, widely expanded into apically broadest discs at tips; hind limbs long, tibiotarsal articulation reaching to between eyes and snout; toes depressed, three-fourths webbed, fringed laterally on free portions and expanded apically into discs about three-fourths as wide as those of fingers. Skin largely smooth above, with broad, flat granules on belly and under surfaces of femora, occasionally finely granulate on sides of head. Color mottled, partly gray to brown above with a figure on anterior portion of back somewhat resembling an hour glass with arms extended to upper eyelids and backwards to upper part of sides at about middle of body, and some bands across limbs, of grayish or brownish black; some white spots on back, or black spots on white background on flanks and sides of thighs; ventral surfaces dirty white mottled on throat with black.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Tympanum diameter.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.
23153	female	71	8.0	24.5	5.0	40	113.0	35	28
23151	do	68	8.0	24.0	4.5	41	112.0	34	27
23152	do	66	8.0	24.0	5.0	38	112.0	35	28
23154	do	58	7.0	21.5	4.0	33	91.0	24	23
23159	do	56	7.0	21.0	4.0	33	89.0	27	22
23157	male	52	7.5	18.5	3.5	31	83.0	26	22
23165	do	43	5.0	15.0	3.0	25	69.0	21	16
23156	do	41	6.0	15.5	3.0	24	61.0	18	16
23162	juvenile	16	2.0	6.0	1.0	8	18.5	6	5

Distribution.—Sunda Islands; Philippines; peninsula of southeastern Asia; India; Hainan Island; Formosa; Hongkong; Kwangtung; Fukien; Kiangsi; Kiangsu.

Local Hakka name.—P'ak-kwai; Chuk-k'yok-k'wai.

English name.—Brown tree frog.

MICROHYLIDÆ (BREVICIPITIDÆ)

31. KALOULA PULCHRA PULCHRA Gray.

Kaloula pulchra GRAY, Zool. Misc. (1831) 38, China.

Four specimens were collected by paths at night: M. V. Z. No. 23190, at Lingnan University, Honam Island, Canton, south-central Kwangtung Province, altitude 20 meters, May 24; M. V. Z. Nos. 23191 to 23193 at Kakchieh, across the river from Swatow, eastern Kwangtung Province, altitude 75 meters, May 25 and July 31, 1936.

The Swatow specimens represent a new, and the most eastern, record for the species.

Description.—Head very small, broader than long; snout short, rounded-truncate; nostrils closer to tip of snout than to eyes; tympanum hidden. Fingers moderately slender, with thickened joints, broad, truncate, apical phalanges, and distinct subarticular tubercles; hind limbs short, tibiotarsal articulation not reaching axilla; both metatarsal tubercles distinct, inner metatarsal tubercle more prominent; toes moderately slender, one-third webbed, barely expanded, rounded-truncate apically, with distinct, rounded, subarticular tubercles. Skin moderately smooth; granular on gular region, feebly granular on top of head and sides of body. Purplish brown with a broad pinkish stripe along each side of back from eye, and a transverse stripe across head between eyes.

Measurements in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
23191	male	68	6.0	40	68	20	22	Swatow.
23192	do	63	6.0	36	59	20	22	Do.
23193	female	68	4.5	37	62	17	21	Do.
23190	do	58	4.0	32	59	17	19	Canton.

Stomach contents.—Ants; termites; spiders; larvæ; carabid beetle.

Distribution.—Kwangtung; Hongkong; peninsula of southeastern Asia; Sunda Islands; India.

Key to the species of Microhyla.

1. Tibia contained at least twice in body length; fourth toe longer than tibia; toes webbed only at extreme bases .... 2.
   Tibia contained only slightly more than one and one-half times in body length; fourth toe shorter than tibia; toes webbed for at least one-third their lengths; length from snout to vent over 25 millimeters.
   M. pulchra.

2. Tibia contained about twice in body length; hind legs one and three-fourths times as long as body........ 3.
   Tibia contained more than twice in body length; hind leg one and one-half times as long as body........ *M. ornata.*
3. Skin of back finely granulose; pale pinkish with sides of body contrastingly dark........ *M. heymonsi.*
   Skin of back with small, slightly raised pinkish red spots and a dark, lobed pattern along middle; sides not very dark........ *M. butleri.*

22. MICROHYLA BUTLERI Boulenger.

Microhyla butleri BOULENGER, Ann. & Mag. Nat. Hist. (7) 6 (1900) 188, Larut Hills, Perak.

A single specimen (No. 23194, M. V. Z.) was taken at southeastern Kiangsi Province, Hong San, altitude 1,050 meters, June 29, 1936.

New to Kiangsi Province.

Description.—Head not distinct from neck; snout broader than long, rounded; nostrils a little closer to tip of snout than to eyes, eyes three-fifths as long as snout. Forelimbs small; fingers slender, slightly expanded apically, fourth two-thirds as long as third; hind limbs with tibiotarsal articulations nearly reaching tip of snout; toes long and slender, one-fourth to one-third webbed, barely expanded apically. Skin fairly smooth, with scattered feeble swellings on dorsal surface. Pale gray, tinged with pink, marked above with a forward-pointing trident-shaped figure extending from between eyes to above shoulders, and a large X-shaped mark on middle of back, followed by an inverted V, all blackish gray; dorsal tubercles pinkish red; hind limbs narrowly banded with dark; throat, chest, flanks, and undersides of limbs densely speckled with dark.

Measurements, in millimeters.—Length, from tip of snout to vent, 28; length of snout, 2.2; width of head, 7; length of forelimb, 13; hind limb, 39; tibia, 11; fourth toe, 12.5.

Stomach contents.—Small ants.

Distribution.—Peninsula of southeastern Asia; Hainan; Kwangtung; Kiangsi; Fukien; Szechwan.

23. MICROHYLA HEYMONSI Vogt.

Microhyla heymonsi VOGT, Sitzgsber. Natur. Fr. Berlin (1911) 181. Formosa.

Nineteen specimens (Nos. 23195 to 23213, M. V. Z.) were taken: eastern Kwangtung Province, 6 at Tsin-leong San, altitude 850 meters, June 2 to 4, 1 at Yim-na San, altitude 600 meters, June 14: southeastern Kiangsi Province, 2 at Hong San, altitude 950 meters, June 28, July 16, 5 at Tai-au-hong, altitude

540 meters, July 3 to 6: southwestern Fukien Province, 2 at Liung-chon San, altitude 800 meters, July 22, 3 at Gang-keu, altitude 550 meters, July 23 to 25.

New to Kwangtung and Kiangsi Provinces.

Description.—Head small; snout rounded; nostrils halfway between eyes and tip of snout; eyes two-thirds as long as snout. Fingers slender, slightly swollen at tips, third much longer than others; toes slender, slightly flattened, webbed only at extreme bases, subarticular tubercles and metatarsal tubercles small. Skin smooth, or with some scattered, minute granules above. Pink or pinkish gray with sides of body black or dark brown and dorsal surface with a faint pattern of irregular longitudinal stripes, a V-shaped mark between eyes, and a black spot near middle of back divided by a pale, slender, vertebral line; throat dusky; abdomen dirty white; legs distantly banded.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
23211	female	23.5	2.0	6.0	12.0	40.0	12.0	12.0	Gang-keu.
23208	do	23.0	2.4	6.5	11.0	37.0	11.0	12.0	Hong San.
23203	male	21.0	2.2	7.0	11.0	37.0	11.0	11.5	Tai-au-hong.
23206	do	19.0	1.6	6.5	10.0	33.0	10.0	11.0	Do.
23195	do	17.7	1.7	5.5	8.5	29.0	9.0	10.0	Tsin-leong San.
23218		15.0	1.7	4.5	6.3	22.0	6.5	7.0	Gang-keu.
23201		8.0	1.0	3.0	4.5	12.5	3.7	4.0	Yim-na San.

Stomach contents.—Ants; termites; elaterid; coccinellid.

Distribution.—Fukien; Kiangsi; Kwangtung; Formosa.

This species was collected at night in short grass on the dykes at edges of paddy fields, where the sharp, frequently repeated chirplike call was very audible.

24. MICROHYLA ORNATA (Dumeril and Bibron).

Engystoma ornatum DUMERIL and BIBRON, Erpet. Gen. 8 (1841) 745, Malabar coast.

Thirty-two specimens (Nos. 23224 to 23255, M. V. Z.) represent this species; eastern Kwangtung Province, 13 from Tsin-leong San, altitude 550 meters, June 2 to 6; 3 from Mei-hsien city, altitude 185 meters, June 8 and 9; 3 at Tai-yong, altitude 650 meters, August 5 and 6; southeastern Kiangsi Province, 2 at Tai-au-hong, altitude 550 meters, July 4 to 7; 1 at Wong-sa-shue, altitude 575 meters, July 9; 1 at Hong San, altitude 650 meters, June 21: southwestern Fukien Province, 9 at Gang-keu, altitude 420 meters, July 25 and 26.

Description.—Nostrils separated by a distance slightly less than interorbital distance; eyes two-thirds as long as snout. Fingers blunt at tips, fourth finger two-thirds as long as third; hind limbs with tibiotarsal articulations not reaching eyes; toes blunt at tips, scarcely webbed. Skin smooth. Gray; sides grayish black, distinctly margined above, back with a pair of sinuous black stripes, starting together as a triangle on occiput, diverging posteriorly and continuing to groins, another pair forming a broad inverted V on posterior part of back indistinctly striped with gray; a faint middorsal pale line; throat black in male.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Fore-limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
23226	female	23.5	2.2	6.0	11	34	10.0	11.5	Tai-au-hong.
23246	do	22.5	2.0	6.5	10	34	01.0	11.0	Tsin-leong San.
23225	male	21.0	2.0	6.0	10	33	10.0	11.0	Wong-sa-shue.
23224	do	21.0	2.0	5.5	9	31	9.0	10.0	Hong San.
23251	juvenile	9.0	1.0	3.0	6	10	3.3	4.0	Tsin-leong San.

Stomach contents (number in parentheses refers to number of stomachs contained in).—Ants in every stomach, small beetles (2); termites (2).

Distribution.—India; Ceylon; peninsula of southeastern Asia; Hainan; Formosa; Hongkong; Kwangtung; Fukien; Kiangsi; Chekiang; Kiangsu; Anhwei; Szechwan; Hunan.

25. MICROHYLA PULCHRA (Hallowell).

Engystoma pulchrum HALLOWELL, Proc. Acad. Nat. Sci. Philad. (1860) 506, between Hongkong and Whampoa.

Nineteen specimens (Nos. 23270 to 23288, M. V. Z.) were collected: southwestern Fukien Province, 16 at Gang-keu, altitude 400 meters, July 24 to 26; eastern Kwangtung Province, 2 at Tsin-leong San, altitude 850 meters, June 2 to 4; 1 at Yim-na San, altitude 550 meters, June 14.

Description.—Snout rounded; nostrils separated by a distance greater than interorbital space; eyes four-fifths as long as snout. Fingers tapering, free part of third finger twice as long as that of fourth; hind limbs with tibiotarsal articulations extending well beyond tip of snout; toes one-third to one-half webbed, tapering, subarticular tubercles distinct. Skin smooth above and beneath. Pale whitish gray with a transverse bar across top of head, an interrupted lateral stripe and a large inverted V on back, followed by isolated subovate spots on back and legs, of black, mostly edged with pale; anterior portion of back with faint grayish stripes parallel to borders of large V; throat and chest mottled.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Body length.	Snout length.	Head width.	Fore limb.	Hind limb.	Tibia.	Fourth toe.	Locality.
23273	female	33.0	4.0	10.0	15.0	57	19.0	17.0	Gang-keu.
23288	male	30.0	3.5	9.5	14.0	56	18.0	17.5	Tsin-leong San.
23271	do	28.5	3.2	9.0	14.0	62	18.0	16.0	Do.
23270	do	27.0	3.0	8.5	14.0	63	17.0	16.0	Do.
23279	juvenile	17.0	1.7	6.0	8.5	32	11.0	9.5	Do.
23286	do	12.0	1.5	3.8	5.0	19	6.5	6.0	Yim-na San.

Stomach contents (number in parentheses refers to number of stomachs contained in).—Ants (most stomachs); termites; weevil (1); beetle (1).

Distribution.—Kwangtung; Fukien; Hupeh; Hongkong; Hainan Island; Tonkin; Cochin-China; Siam.

REPTILIA

SQUAMATA

SAURIA

GEKKONIDÆ

26. GEKKO SUBPALMATUS Guenther.

Gekko subpalmatus GUENTHER, Rept. Brit. India (1864) 104, pl. 12, Chekiang.

Two specimens (Nos. 23343 and 23344, M. V. Z.) were collected: eastern Kwangtung Province, 1 at Tsin-leong San, altitude 850 meters, June 5: southeastern Kiangsi Province, 1 at Hong San, altitude 900 meters, on outside of house at night, June 25, 1936.

New to Kiangsi Province.

Description (23343 and 23344, respectively).—Rostral nearly twice as broad as deep, bordering nostrils; three, and four internasals, respectively, bordering rostral between nostrils; eye nearly two-thirds as long as snout; ear opening with diameter of that of eye. Supralabials 11; infralabials 9, 10; 8, 9; throat covered with minute, even granules; ventral surface of body covered with minute granules, tubercles lacking; tail covered with transverse rows of granular scales above and at sides, and with larger, flatter scales beneath. Humeri and femora with granules larger than those on dorsal surface of body; infradigital lamellæ 9, 9, 10, 12, and 9 on first to fifth fingers, respectively; lamellæ on undersides of toes 10, 12, 13, 15, and 13 on first to fifth toes, respectively. Nine and 12 femoral pores on each side, respectively; a single large tubercular scale on each side of swollen vent region at base of tail. Grayish black and pale gray above, dark, and light grayish white beneath, respectively; infralabials speckled in No. 23343; no banding distinguishable.

Measurements in millimeters.—Total lengths, 82 and 74, respectively; snout to vent, 43, 41; snout to ear opening, 10; width of head, 7, 7.5; axilla to groin, 21, 20; forelimbs, 10; hind limbs, 15, 14.

Distribution.—Szechwan; Kiangsi; Chekiang; Fukien; Kuangtung.

17. HEMIDACTYLUS BOWRINGII (Gray).

Doryura Bowringii GRAY, Cat. Liz. Brit. Mus. (1845) 156, probably Hongkong.

Two specimens (Nos. 23296 and 23297, M. V. Z.) female and male, respectively, were collected in eastern Kwangtung Province, at Mei-hsien (Kaying, Moejen), altitude 200 meters, June 8, 1936, on the outside of houses at night.

Description.—Snout nearly twice as long as eye. Rostral strongly indented above; supralabials 11; infralabials 8; mental large, acute behind; two pairs of enlarged chin shields, those of second pair distant. Dorsal surface of head and body covered with small granular scales of only slightly varying size, those on tail arranged in irregularly transverse rows. Lamellæ on undersides of fingers and toes divided; infradigitals 3, 7, 8, 9, and 6 on first to fifth fingers, respectively; toe lamellæ 5, 8, 11, 11, and 7, respectively. Male with 13 femoral pores on each side. Pale grayish white mottled with irregular faint dark markings above; white beneath.

Measurements, in millimeters (Nos. 23296 and 23297, respectively).—Total length, 94, 93; snout to vent, 44, 45; snout to ear opening, 13.5, 12; axilla to groin, 22, 21; forelimbs, 14; hind limbs, 17.

Distribution.—Fukien; Kwangtung; Hongkong; Yunnan; Burma; India; Formosa; Ryu-kyu (Loochoo) Islands.

AGAMIDÆ

28. GONOCEPHALUS LEPIDOGASTER (Cuvier).

Calotes lepidogaster CUVIER, Eg. Anim. ed. 2 2 (1829) 39, Cochin-China.

Fourteen specimens (Nos. 23419 to 23432, M. V. Z.) represent this species: No. 23432 was taken in eastern Kwangtung Province, at Yim-na San, altitude 650 meters, June 14; all the others were taken in southwestern Fukien Province, at Gangkeu, altitude 575 to 650 meters, July 23 to 26, on shrubbery in the jungles.

Description.—Head triangular in front, rectangular behind, concave between and before eyes and on loreal region; canthus rostralis and supraoculars prominent; snout rounded apically, nearly one and one-half times as long as eye cavity. Scales on top of head small, irregular, about 17 in a row between supraoculars, supraoculars 6 on either side; nostril five-eighths distance from end of snout to eye; supra- and infralabials 9 to 11, similar in size and shape; mental narrow, acute behind; chin shields very small, those of first pair meeting or separated; throat scales small, carinate, subacuminate. Tympanum visible, one-fourth diameter of eye. A strong emargination behind last supraocular, followed by a curved spine 2 or 3 millimeters long; two strong spines and some lesser spines at each side of occiput; nuchal crest composed of 6 or 7 strong, laterally compressed spines, 6 millimeters long in No. 23432 (male); dorsal crest of strongly carinate or compressed spinous scales; dorsal surface of body covered with small, irregular, smooth scales, large, acuminate scales at intervals; ventral scales and all tail scales strongly carinate. Male (No. 23432) black on upper portion of head and neck; lower parts bluish white; sides of body and legs blue-green; banded along back, and spotted on sides and legs with black; tail blackish brown, banded with blue; some males less distinctly colored; females dirty brown with traces of male pattern, lower eyelid vertically banded.

All the females contained eggs without evident embryos, generally 9 to 13 in number and measuring 4 to 9 millimeters in diameter, fairly round.

Stomach contents (number in parentheses refers to number of stomachs contained in).—Indeterminable insects (8); adult beetles (3); crickets (2); snail (2); centipede (1); hymenopteran wasp (?); and a scarabæid beetle larva (?).

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout to vent.	Snout to tympanum.[a]	Head width.	Arm length.[b]	Leg length.	Fourth toe.[c]
23432	male	227	80	25.0	18.5	46	70	25
23431	female	211	68	22.0	15.5	47	73	25
23419	do	202	83	22.0	14.0	43	63	23
23428	do	186	76	21.5	13.5	43	62	22
23429	male	217	77	22.0	14.5	51	72	26
23424	do	218	76	21.0	14.5	48	70	24
23425	do	188	65	18.0	13.0	42	61	22
23421	do	95	38	11.0	8.0	24	34	12

[a] This measurement includes tip of snout to posterior edge of tympanum.

[b] Width across head at supraoculars.

[c] Measured on outer side of fourth toe.

Distribution.—Fukien; Kwangtung; Kwangsi; Hainan Island; Indo-China; Siam; Burma.

Local Hakka name.—*San-kyu-tai.*

SCINCIDÆ

29. SPENOMORPHUS INDICUS (Gray).

Hinulia indica GRAY, Ann. & Mag. Nat. Hist. (2) 12 (1853) 388, Sikkim.

Ten specimens (Nos. 23528 to 23537, M. V. Z.) represent this species: southern Kiangsi, 7 adults from Hong San, altitude 750 to 900 meters, June 29 and July 16; southwestern Fukien Province, 1 adult and 2 juveniles from Gang-keu, altitude 600 meters, July 23 and 24, 1936.

New to Kiangsi Province.

Description.—Nasal obliquely oval, frontonasal broader than long, broadly in contact with rostal, nasals, and prefrontals, narrowly bordering frontal and anterior loreals; frontal twice as broad as long, strongly narrowed and nearly acute posteriorly; frontoparietals two-thirds as long as frontal, larger than interparietal and smaller than parietals; parietals obliquely transverse; supraoculars 5; snout a little longer than eye; supralabials 7, sometimes 8; first chin shield entire, those of second pair touching, third pair separated. Body encircled at middle with 36 to 38 longitudinal rows of scales. No. 23531 with about 87 scales in a row along midventral line from chin to vent, its longest toe with about 20 scales along underside. Brown speckled with black and tan above, white with greenish iridescence below, and dark brown speckled with pale blue on upper parts of sides, changing to pale blue speckled with dark brown on lower parts of sides; a fine dark line along upper part of sides of unregenerated tail.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout to vent.	Snout to ear.	Head width.	Axilla to groin.	Arm length.	Leg length.
23530	female	249	97	18	13.0	49	22	36
23531	do	205	96	19	13.0	50	25	39
23532	male	195	87	19	12.0	44	24	39
23537	female	204	77	16	11.0	37	23	36
23533	do	164	60	14	9.0	31	16	27
23536	juvenile	(67)	27	7	5.5	12	9	14

No. 23529 contained twelve eggs with embryos just beginning to be pigmented, 36 to 44 millimeters long.

Stomach contents (number in parentheses refers to number of stomachs contained in).—Caterpillars (3), beetles (2), crickets (6), earwig (1), termites (1), earthworm (1), snail (1).

Distribution.—Southern, central, and western China and Shensi; Himalaya and Annam to Malay Peninsula.

30. ATEUCHOSAURUS CHINENSIS Gray.

Ateuchosaurus chinensis GRAY, Cat. Liz. Brit. Mus. (1845) 107, China.

A single imperfect specimen (No. 23541, M. V. Z.) was found dead on a porch in Swatow, eastern Kwangtung Province, altitude 40 meters, August 26, 1936.

Description.—Head not distinct from neck, narrowed anteriorly; enlarged plates few; frontal more than twice as long as broad, extending nearly to posterior border of eyes, constricted in middle; frontoparietals very small; interparietals subequal in size to each frontoparietal; parietals hardly longer than frontoparietals, transverse, supraoculars 4 or 5; scales on posterior portion of head similar to those on neck, body and tail, broadly hexagonal, smooth; ten rows of scales across occiput between ear openings; scales in about 30 rows around middle of body; about 36 scales in a row from axilla to base of hind limb.

Measurements, in millimeters.—Length, from snout to vent, 64; breadth of head, 9; axilla to groin, 36.

Distribution.—Fukien; Kwangtung; Hainan Island; Hongkong; Tonkin.

31. EUMECES CHINENSIS CHINENSIS (Gray).

Tiliqua chinensis GRAY, Ann. Nat. Hist. 2 (1838) 289, China.

Fifty-five specimens (Nos. 23542 to 23596, M. V. Z.) were collected: southwestern Fukien Province, 14 adults and 13 juveniles, from Gang-keu, altitude 450 to 550 meters, July 23 to 27; 1 juvenile from east of Haba, altitude 500 meters, July 18, 1936; southeastern Kiangsi Province, 7 adults from Hong San, altitude 600 to 700 meters, June 23 to 26; 1 adult from Kit-tan, altitude 500 meters; eastern Kwangtung Province, 12 juveniles from Tai-yong, altitude 650 meters, August 4 to 7; 5 adults from Mei-hsien (Kaying), altitude 200 meters, June 9 and 18; 1 specimen, seen but not caught, Tsin-leong San, altitude 826 meters.

Description.—Snout narrowed in front of eyes, rounded apically, longer than horizontal diameter of eye; rostral almost equilaterally triangular, separated from frontonasal by internasals; prefrontals more broadly in contact with frontal, frontonasal, and first loreals, than with each other, second loreals, and first two supraoculars; frontal one and one-half times as long as broad, slightly broader anteriorly than posteriorly; frontoparietals about as broad as long, larger than interparietal, which is longer than broad; parietals oblique, subrhomboidal; second loreal one and one-half times as long as deep; supralabials 7; infralabials 8 or 9; first two chin shields entire, third divided, fourth separated. Scales in 24 rows around body at middle; 55 to 60 scales in a row along midventral line from chin to vent. Adults dull brown above, brown and coppery red at sides, white on ventral surface; juveniles (to 130 millimeters long) black with three silvery, green, dorsal stripes on back and rows of spots on sides, head coppery tan with black sutures, labials largely white, tail steel-blue.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Total length.	Snout to vent.	Snout to ear.	Head width.	Axilla to groin.	Arm length.	Leg length.	Locality.
23585	female	184	66	14.0	10	32	15	22	Mei-hsien.
23550	male	237	88	17.0	13	38	24	34	Kit-tan.
23543	do	200	73	15.5	12	27	22	21	Hong Shan.
23546	female	219	89	20.0	16	43	24	37	Do.
23545	do	236	93	18.0	14	48	22	34	Do.
23542	do	204	75	16.0	12	39	22	30	Do.
23556	do	(172)	109	24.0	21	56	28	38	Gang-keu.
23560	do	269	101	20.0	14	57	28	35	Do.
23566	juvenile	112	44	6.5	7	24	11	18	Do.
23580	do	88	30	8.0	6	18	11	14	Haba.

Contents of nearly fifty stomachs examined (number in parentheses refers to number of stomachs contained in).—Crickets (7); spiders (7); caterpillars (6); scarabæid beetles of the subfamily Melolonthinæ (7); scarabæids of the genus *Euchlora*

(2); tenebrionid beetle (1); other beetles (4); snails (3); acridiid grasshoppers (2); tettigoniid grasshoppers (2); mole crickets (2); dragonfly nymphs (2); homopteran leafhopper (1); ranatran water bug (1); a belostomid water bug (*Sphæroderma*) (1); trichopteran and a chrysomelid beetle larva (?).

Not a single egg was found in any of the females.

Distribution.—Chekiang; Kiangsi; Hunan; Szechwan; Kwangsi; Kwantung; Hongkong; Hainan Island.

Local Hakka name.—*K'eu-ma sa.*

SERPENTES

COLUBRINÆ

12. NATRIX ÆQUIFASCIATA Barbour.

Natrix æquifasciata BARBOUR, Bull. Mus. Comp. Zool. 51 (1908) 317, Five Finger Mountains, Hainan Island.

Two specimens (Nos. 23615 and 23616, M. V. Z.) were taken in southeastern Kiangsi Province: 1 female, Sungwu, altitude 450 meters, July 12; 1 male, Hong San, altitude 800 meters, July 16, 1936.

Description (Nos. 23615 and 23616, respectively).—Very heavy-bodied, large; head swollen behind, preoculars 2—1, 2—1; postoculars 3—3, 3—4; suboculars 0—1, 1—1; upper labials 8; anterior temporals 1—2, 3—3; posterior temporals 3—3, 3—3; body scales keeled, outermost row weakly so, in 19 rows on neck and 17 rows at midbody and before vent; ventrals 152, 151; subcaudals (incomplete), 79. Total lengths, 780 millimeters (tail incomplete), 603; tails (110), 154. Brownish gray above, white below, with distinct bands on body and tail, encircling body but occurring alternately on ventral surface.

The stomach of the male contained three fish. The ovaries of the female contained over twenty eggs, the largest measuring about 28 by 13 millimeters.

Distribution.—Fukien; Kiangsi; Kwangsi; Kwangtung; Hainan Island.

Local Hakka name (Sungwu).—*Pak-ng Tou.*

13. NATRIX ANNULARIS (Hallowell).

Tropidonotus annularis HALLOWELL, Proc. Acad. Nat. Sci. Phila. 8 (1856) 151, Ningpo.

Four specimens (Nos. 23618 to 23621, M. V. Z.) were taken in eastern Kwangtung Province, at Tai-yong, altitude 650 meters, August 4 to 6, 1936.

New to Kwangtung Province.

Description.—Preoculars single; postoculars 3; anterior temporals 2; posterior temporals 3; supralabials 9—9 in three, 9—8 in No. 23618; infralabials 9. Body scales in 19 rows on neck and body and 17 before vent, keeled except on outermost rows. Grayish brown above; ventral surface red or yellow, with partially alternate black bands; labials narrowly edged with black.

Measurements in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Subcaudals.	Length.	Tail.	Bands.	
						Body.	Tail.
23618	female	156	66	337	69	39	21
23620	do	67	67	483	98	38	23
23619	male	161	incomplete	461	(54)	40	(9)
23621	female	157	69	660	139	39	21

The stomach of No. 23619 contained three small fish. The ovaries of No. 23621 held 8 eggs, 25 to 36 millimeters long, the four largest containing embryos 72 to 80 millimeters long.

Distribution.—Anhwei; Kiangsu; Fukien; Kiangsi; Kwangtung; Tonkin; Formosa.

34. NATRIX BOULENGERI Gressitt. Plate 1.

Natrix boulengeri GRESSITT, Proc. Biol. Soc. Wash. 50 (1937) 125–128.

Two female specimens were collected; the type, No. 23623 M. V. Z., in eastern Kwangtung Province, at Tai-yong, altitude 640 meters, August 5; and the paratype, No. 23622 M. V. Z., in southeastern Kiangsi Province, at Hong San, altitude 850 meters, June 30, 1936.

Description.—Neck slender; head broad behind middle; snout narrowed and truncate. Maxillary teeth 28 on right side in type, 28 and 29 in paratype. Rostral nearly one and one-half times as broad as deep; internasals as long as broad, narrowed apically, rounded externally; prefrontals one and one-fourth times as long as internasals, their dorsal portions nearly square; frontal one and one-half times as long as broad, barely longer than interparietal suture and barely longer than its distance from end of snout; supraoculars one-half as broad as, and slightly shorter than, frontal; parietals seven-twelfths as broad as long. Nasal nearly twice as long as deep; loreal one and two-thirds times as long as deep; preoculars single, a rudimentary suture crossing it in paratype, narrowed below; postoculars 2—2, lower postocular smaller; temporals 1—1—2 on each side, first temporal twice as long as second. Supralabials 9—9 in type, 8—8 in paratype, last three supralabials subequally large; mental broader than long, acute apically; infralabials 9—10 in type, first five infralabials in contact with anterior chin shields, the latter two-thirds as long as posterior pair. Body scales in 19 rows from one and one-half head lengths behind head to two to three head lengths beyond middle of body, in 17 rows before vent, finely keeled, except for the first row on each side. Ventrals 144 in type, 145 in paratype; anals divided; subcaudals 94 in paratype.

Total lengths 462 and 658 millimeters; tails (63) and 219, in type and paratype, respectively.

Largely gray and black above, with a pair of pale longitudinal dorsal stripes. Head dark brownish black, dorsal surface finely vermiculated with gray, a pair of small gray-white spots before middle of parietals; lower portions of nasal, loreal, and preocular partially mottled with gray; a striking, ivory-white stripe on each side, commencing on inferior postocular and upper hind corner of sixth supralabial, extending subobliquely to side and top of nape, from where it continues as one of the dorsal body stripes; first four supralabials black below, speckled above, fifth supralabial speckled anteriorly, black posteriorly, sixth supralabial largely black on upper half, speckled below; last three supralabials largely pure black except for ivory-white stripe crossing upper portions; infralabials partly black, partly white and black-speckled; chin shields partly spotted. Body gray-black to blue-black, finely speckled with white on sides, crossed by irregular bands formed of indistinct black spots; stripes pinkish brown, anteriorly composed of more or less joined elongate-oblong spots on seventh and eighth scale rows, posteriorly continuous stripes along fifth and sixth scale rows. Ventrals creamy white, each with a squarish black spot on each side, separated from external margin by a finely black-mottled area that on anterior ventrals forms a more or less distinct, narrow, light stripe.

The type contained three large elongate-oblong eggs, 22 to 29 millimeters long and 7 to 11 millimeters in diameter, with no evident embryos. The habitat is probably damp shady regions in the neighborhood of mountain streams and rice fields.

Distribution.—Northern and eastern Kwangtung and southern Kiangsi.

35. NATRIX PERCARINATA (Boulenger).

Tropidonotus percarinatus BOULENGER, Proc. Zool. Soc. London (1899) 163, pl. 17, Kuatun, Fukien.

Twenty-eight specimens (Nos. 23629 to 23656, M. V. Z.) were collected: southeastern Kiangsi Province, at Hong San, altitude 600 to 900 meters, June 22 to 30 and July 16: eastern Kwangtung Province, 2 at Yim-na San, altitude 500 meters, June 14; 2 at Tai-yong, altitude 650 meters, August 4: southwestern Fukien Province, 1 at Gang-keu, altitude 550 meters, July 23. Specimens were seen in rice fields at 900 meters altitude on Hong San.

Description.—Preoculars single; postoculars 4, 5, or 3; anterior temporals 2; posterior temporals 3—3 in twenty-five specimens, 3—4 in two specimens, and 2—3 in one specimen, supralabials 9, 8 on one side in two specimens and 10 on one side in one specimen, 3 before eye, 2 touching eye, and 4 behind eye in twenty-four specimens, the other four having the formulæ 4—1—4, 3—2—4 in No. 23644, 4—1—4, 3—2—3 in No. 23630, 3—2—5, 3—2—5 in No. 23650, and 3—2—4, 2—2—4 in No. 23652. Body scales in 19 rows from neck to midbody, 17 rows before vent; ventrals 135 to 143, subcaudals 76 to 84 in males, 70 to 81 in females, second and third subcaudals entire in No. 23639; largest female, 637 millimeters long from snout to vent; largest male, 448. Grayish brown with 29 to 37 black bands on body, indistinctly banded on tail; bands generally alternating along midventral line, but all except first four meeting in No. 23649 (juvenile).

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Subcaudals.	Total length.	Tail length.	Postoculars.	Body bands.
23629	female	137	77	673	189	4—5	25
23634	male	139	78	497	149	4—4	34
23645	do	141	76	688	160	4—4	37
23630	female	143		796	(159)	4—4	33
23642	do	137	81	753	211	4—5	34
23633	do	136	70	631	171	5—3	33
23638	do	140	73	426	117	4—4	29
23649	male	138	77	327	86	4—5	37
23650	female	139	80	725	210	5—5	34
23651	male	136	84	487	142	4—5	33

Stomachs of six specimens contained tadpole remains; stomachs of five others contained frog remains, three of which are referable to *Rana limnocharis* and one probably to *Rana spinosa;* stomachs of four others contained fish remains, one of which was

145 millimeters long; one stomach seemed to contain several very small bird embryos, suggesting that the snake had eaten eggs from a bird's nest. The ovaries of No. 23640 (Hong San, June 28) contained six small eggs.

Distribution.—Szechwan; Hupeh; Chekiang; Fukien; Kiangsi; Kwangsi, Kweichow; Kwangtung; Hainan Island.

Local Hakka name.—*Fa-sam-bian.*

36. NATRIX PISCATOR (Schneider).

Hydrus piscator SCHNEIDER, Hist. Amphib. 1 (1799) 247, East Indies.

Fourteen specimens (Nos. 23669 to 23682, M. V. Z.) were collected: eastern Kwangtung Province, 7 at Tai-yong, altitude 650 meters, August 4 and 5, 2 at Mei-hsien, altitude 225 meters, June 9 and 17: southwestern Fukien Province, 3 at Gang-keu, altitude 550 meters, July 24 and 25: southeastern Kiangsi Province, 1 at Hong San, altitude 600 meters, June 23; 1 at Sungwu, altitude 450 meters, July 13.

Description.—Preoculars single; postoculars 3, 4, or 5; anterior temporals 2, 3 on one side in one specimen; posterior temporals 2, 3 on one side in one case; supralabials 9—9 in thirteen cases, 10—8 in one case; scale rows 19—17—17; ventrals 127 to 129 in males, 140 to 147 in females; subcaudals 81 or 82 in males, 70 to 79 in females. The Tai-yong specimens are grayish brown to putty-gray, spotted with black; the two Mei-hsien specimens are olive-green and yellowish green, respectively, with the dark margins of ventrals very narrow.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Subcaudals.	Total length.	Tail length.	Postoculars.
23681	female	146		740	(130)	3—3
23678	do	140	79	727	194	4—4
23679	do	145	73	632	158	3—3
23682	male	128	81	197	54	4—4
23674	female	143	70	645	172	3—3
23673	do	144	72	652	164	3—4
23672	male	127	82	565	178	4—3

Two stomachs contained frog and tadpole remains, all of *Rana limnocharis;* two contained fish, those in one being a rainbow fish and an eel; the stomach of No. 23675 contained a pentatomid plant bug, and that of No. 23669 contained vegetable matter.

Distribution.—Chekiang; Fukien; Kiangsi; Kwangsi; Yunnan; Kwangtung; Hainan Island; also Formosa and India to the Malay Archipelago.

87. NATRIX SAUTERI (Boulenger).

Tropidonotus sauteri BOULENGER, Ann. & Mag. Nat. Hist. (8) 4 (1909) 495, Formosa.

Two specimens, both females, were collected: southeastern Kiangsi Province, No. 23685 M. V. Z., Hong San, altitude 950 meters, June 30; southwestern Fukien Province, No. 23686 M. V. Z., Gang-keu, altitude 500 meters, July 23.

New to Kiangsi Province.

Description.—Preoculars single; postoculars 3—3; anterior temporals 1—1 in both; posterior temporals 2—2, 1—2; supralabials 7—7 in both; body scales 17—17—17, outermost row very weakly keeled; ventrals 132, 129; subcaudals 71, 78. Mouse gray, No. 23685 slightly reddish; supralabials white, edged with black; nuchal white stripe extending from supralabials a short distance along neck, nearly converging; a row of small light spots along each side of dorsal surface; ventrals edged with black at either side, the spots forming almost continuous dark stripes.

Total lengths 380, 370 millimeters; tails 104, 110. No. 23686 was taken by a rice-fields irrigation ditch at the lower edge of a forest; its stomach contained an earthworm.

These specimens seem to differ slightly from Formosan specimens in having the nuchal white stripe arising from the supralabials instead of from the infralabials, the supralabials less regularly marked with black and the black spots at sides of ventrals forming a more continuous longitudinal stripe.

Distribution.—Formosa; Fukien; Kiangsi; Kwangtung; Kwangsi; Szechwan.

88. NATRIX STOLATA (Linnæus).

Coluber stolatus LINNÆUS, Syst. Nat. ed. 10 (1758) 219, "America."

Fifteen specimens (Nos. 23711 to 23725, M. V. Z.) were collected: eastern Kwangtung Province, 5 at Tai-yong, altitude 650 meters, August 4 to 6; 2 at Yim-na San, altitude 500 meters, June 12 and 15; southwestern Fukien Province, 6 at Gang-keu, July 24 to 26; southeastern Kiangsi Province, 2 at Hong San, altitude 600 to 800 meters, June 22 and July 15.

Description.—Preoculars single, 2 on one side in No. 23724; postoculars 3—3 in eleven specimens, 3—4 in three specimens, and 4—4 in one; anterior temporals single; posterior temporals 2—2 in twelve specimens, 2 on one side and 1 on the other in three specimens; supralabials 8—8 in all; body scales 19—17—17, keeled; ventrals 150 to 155 in males, 146 to 154 in females; subcaudals 77 to 81 in males, 70 to 78 in females.

Yellowish gray with a pair of dorsal stripes; head and neck reddish yellow; ventral surface creamy.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Sub-caudals.	Total length.	Tail length.	Locality.
23725	female	147	65	544	(128)	Tai-yong.
23724	do	153	70	632	143	Do.
23721	male	155	79	488	128	Do.
23722	do	152	81	536	143	Do.
23720	female	150	73	621	148	Yim-na San.
23713	do	148	73	547	132	Gang-keu.
23716	male	152	78	521	131	Do.
23718	female	152	71	206	49	Do.
23711	male	152	77	513	130	Hong San.

Stomachs of 4 specimens from Tai-yong and Gang-keu contained remains of *Rana limnocharis;* one of these also contained part of a scarabæid beetle of the genus *Euchlora*, possibly eaten by the frog. Ovaries of 2 females from Tai-yong contained ten and nine eggs, respectively, 17 to 18 millimeters long; 1 female from Hong San (June 22) held six eggs, averaging 22 millimeters in length; 1 female from Gang-keu (July 23) held seven eggs, measuring about 18 millimeters in length.

Distribution.—Chekiang; Fukien; Kiangsi; Kwangsi; Yunnan; Kwangtung; Hainan; Formosa; India; Burma; Siam; Malay Peninsula.

Local Hakka name.—Tso-fa Sa.

89. PSEUDOXENODON BAMBUSICOLA Vogt.

Pseudoxenodon bambusicola VOGT, Archiv Naturg. 88 A 10 (1922) 138, northern Kwangtung.

A single male specimen (No. 23747, M. V. Z.) southeastern Kiangsi Province, taken at Hong San, altitude 850 meters, June 23.

New to Kiangsi Province.

Description.—Head broad and flattened; supralabials 8; preoculars single; postoculars 3; anterior temporals 2; posterior temporals 3—2; body scales oblique, keeled, in 19 rows from neck to midbody and 15 before vent; ventrals 137; subcaudals 54. Light pinkish brown, yellowish on forebody, with twelve transverse brown bands on body and a pair of dorsal brown stripes commencing before middle of body and extending to tip of tail; labials yellow, nearly immaculate; a distinct black stripe behind each eye and a longer stripe on each side of neck as far as first transverse band; posterior portion of body and tail with a distinct light stripe just above ventrals and subcaudals, respectively.

Total length, 459 millimeters; tail, 89.

Distribution.—Fukien; Kiangsi; Kwangtung; Hainan Island.

40. OPISTHOTROPIS LATOUCHII (Boulenger).

Tapinophis latouchii BOULENGER, Proc. Zool. Soc. London (1899) 160, pl. 18, Kua-tun, Fukien.

Southeastern Kiangsi Province, 1 female (No. 23749, M. V. Z.), taken at Tai-au-hong, altitude 580 meters, July 6, near a stream.

Description.—Prefrontals single; loreals more than twice as long as deep, broadly in contact with eyes; no trace of preoculars; postoculars 2; temporals 1—1; supralabials 9—9; infralabials 8—7, first four in contact with anterior chin shields; body scales in 17 rows, weakly keeled on body, moderately keeled on tail. Ventrals 145; subcaudals 55. Gray-brown above, with a narrow black stripe between each two scale rows; yellowish white below, except for subcaudals which are all edged anteriorly and at either side with mottled brown; anterior supra- and infralabials brownish black, posterior supralabials dark above and light below.

Total length, 401 millimeters; tail, 80.

The stomach contained an earthworm 150 millimeters long.

Distribution.—Fukien, Kiangsi, and Kwangtung Provinces.

Local Hakka name.—*Nai Sa.*

41. OPISTHOTROPIS MAXWELLI Boulenger.

Opisthotropis maxwelli BOULENGER, Ann. & Mag. Nat. Hist. (8) 14 (1914) 483, southern Fukien.

Four specimens (Nos. 23750 to 23753, M. V. Z.) were collected: southeastern Kiangsi Province, 2 at Hong San, altitude 800 to 900 meters, June 30 and July 16: eastern Kwangtung Province, 1 at Yim-na San, altitude 550 meters, June 12: southwestern Fukien Province, 1 at Liung-chon San, altitude 780 meters, July 22.

New to Kiangsi and Kwangtung Provinces. Previously known only by the unique type from southern Fukien.

Description.—Snout broadly rounded-truncate, flattened, slightly projecting, four times as long as eye. Rostral one and one-half times as broad as deep; internasals oblique laterally, nearly twice as long as broad; nasal cleft dividing nasal into two unequal parts, below nostril extending to posterior corner of first supralabial; prefrontal single, more than twice as broad as long; frontal short, broader than long, three to four times as broad as each supraocular; parietals large, each over one and one-half as long, and fully as broad, as frontal. Loreal one and one-half to two times as long as deep; preoculars single; postoculars 2; anterior temporals single; posterior temporals 2, single on one side in No. 23751. Supralabials 7, first reaching posterior portion of nasal, fifth reaching eye, seventh as long as two preceding; infralabials 8 or 9; anterior chin shields longer and broader than posterior, touching first five infralabials. Scales in 17 rows throughout, smooth on neck, feebly keeled from before middle of body, moderately keeled on tail. Ventrals 158 and 160 in males, 151 and 153 in females; subcaudals 64 and 65 in males, 63 and 65 in females. Total length of largest specimen, 359 millimeters. Black above, including supra- and infralabials, yellow-orange beneath; subcaudals partly black at sides, yellow along middle to just anterior to tip of tail.

Measurements in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Sub-caudals.	Total length.	Tail length.	Locality.
23750	female	153	63	359	79	Hong San.
23751	do.	151	65	348	99	Do.
23753	male	160	65	349	76	Yim-na San.
23752	do.	158	64	359	78	Liung-chon San.

The stomach of No. 23751 contained remains, probably of an insect larva. In No. 23750 the third to sixth subcaudals are entire.

Distribution.—Southern and western Fukien; southeastern Kiangsi; eastern Kwangtung.

42. ZAOCYS DHUMNADES MONTANUS Pope.

Zaocys dhumnades montanus POPE, Amer. Mus. Novitates 325 (1928) 2, Chungan-hsien, Fukien.

A single female specimen (No. 23759, M. V. Z.) was taken in southeastern Kiangsi Province, Hong San (northeast slope), altitude 840 meters, July 14, 1936.

This is the first Kiangsi record for this subspecies.

Description.—Head narrow, slightly wider than neck; dorsal head plates large, frontal transverse anteriorly, parietals truncate behind; 2 pre- and 2 postoculars; eye nearly as long as its distance from tip of snout; temporals 2—2; supralabials 8;

body scales in 16 rows on neck, 14 at midbody and before vent, 2 middle rows keeled except on neck; ventrals 202; subcaudals 120. Light brown on head, orange-brown along dorsal surface of anterior part of body, a wide black stripe along either side of vertebral line; lower sides and ventrals pale bluish, edged with black.

Total length 1,360 millimeters; tail 409 (incomplete).

The ovaries contained a single, flattened, oblong-oval egg, 31 by 13 millimeters.

Distribution.—Fukien; Kiangsi; Kwangtung; Hunan; Kwangsi; Szechwan; Tonkin.

Local Hakka name.—*Han-nan Sa.*

43. PTYAS KORROS (Schlegel).

Coluber korros SCHLEGEL, Phys. Serp. 2 (1837) 139, Java.

Two male specimens (Nos. 23761 and 23762, M. V. Z.) represent this species; the former was collected in southeastern Kiangsi Province, Hong San, altitude 650 meters, June 22, 1936; the latter in eastern Kwangtung Province, Mei-hsien (Kaying), altitude 200 meters, June 9.

Description (Nos. 23762 and 23761, respectively).—Loreals 3; preoculars 2; postoculars 2; anterior temporals 2—2; posterior temporals 2—2, 2—3; supralabials 8; 5 infralabials in contact with anterior chin shields. Body scales keeled posteriorly in the former, smooth in the latter, in 15 rows on neck, 11 rows at midbody, and 11 rows before vent in 23762 and 15—13—11 in 23761. Ventrals 167 and 162; subcaudals 121 and 123. Brown above, striped with darker along middle of each scale row from before midbody; ventral surface white, bluish at sides.

Total length, 1,370 and 1,208 millimeters; tails, 452 and 419.

The stomachs contained several *Rana limnocharis* and the larva of a water beetle of the family Dytiscidæ.

Distribution.—South China; Hainan Island; Formosa; eastern Himalayas to Malay Archipelago.

44. PTYAS MUCOSUS (Linnæus).

Coluber mucosus LINNÆUS, Syst. Nat. ed. 10 (1758) 226, "Indiis."

Two specimens were collected: eastern Kwangtung Province, 1 male (No. 23769, M. V. Z.) at Mei-hsien (Kaying), altitude 220 meters, June 9, 1936; 1 female (No. 23770, M. V. Z.) at Kakchieh, Swatow, August 24.

Description (23769 and 23770, respectively).— Loreals 3; preoculars 2; postoculars 2; anterior temporals 2—2; posterior temporals 2—3, 2—2; supralabials 8; scale rows 19—17—14; ventrals 196, 192; subcaudals 118, 112. Dull brown above, narrowly and irregularly banded with black posteriorly; labials light, edged posteriorly with black; ventrals yellow, edged with black at sides of posterior margins on neck and posterior portion of body; subcaudals similarly marked.

Total lengths 1670, 1850 millimeters; tails 415, 443.

The stomach of No. 23769 contained a *Rana rugulosa* and a crab; that of No. 23770 a frog and some plant material.

Distribution.—Eastern and southern China; Tibet; Transcaspia and Afghanistan south to Ceylon and east and south to the Malay Archipelago.

46. EURYPHOLUS MAJOR (Guenther).

Cyclophis major GUENTHER, Cat. Colubr. Brit. Mus. (1858) 120, near Ningpo.

Eight specimens (Nos. 23786 to 23793, M. V. Z.) were collected: eastern Kwangtung Province, 1 at Yim-na San, altitude 550 meters, June 14; 2 at Tai-yong, altitude 650 meters, August 4 and 5, 1936: southeastern Kiangsi Province, 3 at Hong San, altitude 800 to 900 meters, June 26 to 30; 1 at Tai-au-hong, altitude 520 meters, July 4: southwestern Fukien Province, 1 at Liung-chon San, altitude 650 meters, July 22.

Description.—Slender; head narrow; snout nearly pointed; body scales smooth, in 15 rows from neck to vent. Body grass-green above, pale yellowish green beneath, except for No. 23787 which (in alcohol) is dull grayish blue above with the anterior two-thirds of each ventral the same color except on the neck, where they are white. No. 23789 has the supralabials 4—6, the others all 8—8. No. 23786 has an extra scale on each side between lower postocular, anterior temporal and fifth to seventh supralabials; its color does not differ from that of the larger specimens, though its length is only 312 mm.

No. 23788 contained six eggs, measuring 18 to 20 millimeters in length and 8 to 10 millimeters in diameter, in an early stage of development (July 4). Some of the snakes were found on the ground in bamboo forests; one hid under some rocks while trying to escape; another was found in a vine in a shrub one and one-half meters above the ground. The stomachs contained earth or the remains of earthworms.

Measurements in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Sub-caudals.	Total length.	Tail length.	Locality.
23792	male	161	95	785	218	Tai-yong.
23790	do	166	89	760	200	Yim-na San.
23789	do	154	82	690	190	Tai-au-hong.
23791	female	168	81	684	161	Tai-yong.
23793	do	161	81	640	179	Liung-chon San.
23788	male	167	88	617	160	Hong San.
23787	female	165	80	593	147	Do.
29786	male	162	90	312	78	Do.

Distribution.—Szechwan; Hupeh; Kiangsu; Chekiang; Fukien; Kiangsi; Hunan; Kwangtung; Tonkin; Formosa.

Local Hakka name.—Chan-liuk Sa.

46. HOLARCHUS FORMOSANUS (Guenther).

Simotes formosanus GUENTHER, Ann. & Mag. Nat. Hist. (4) 9 (1872) 20, Takao, Formosa.

A single male specimen (No. 23799, M. V. Z.) was taken in southeastern Kiangsi Province, Hong San, altitude 900 meters, June 30, 1936, near the edge of the forest.

Description.—Cylindrical; head short, hardly distinct from neck; snout very blunt. Rostral large; supralabials 8, oculars 2—2, and temporals 1—2 on each side; body scales smooth, in 19 rows at neck and midbody and 16 before vent; ventrals 160; tail incomplete. Light brown above with dark-brown bands; head distinctly marked with two oblique stripes on each side and an inverted V on occiput.

Total length, 511 millimeters; snout to vent, 445.

The stomach of this specimen contained remains which were probably those of insect larvæ.

Distribution.—Chekiang; Kiangsi; Fukien; Kwangtung; Kwangsi; Hainan Island; Tonkin; Formosa.

47. HOLARCHUS VIOLACEUS (Cantor).

Coronella violacea CANTOR, Proc. Zool. Soc. London (1839) 50, Rangpur, Bengal.

A single female specimen (No. 23801, M. V. Z.) was taken in eastern Kwangtung Province, Yim-na San, altitude 550 meters, June 13.

Description.—Head short, truncate; rostral large; preoculars 1—1; postoculars 2—2; temporals 2—2, 2—3; supralabials 10—10; body scales smooth, in 17 rows at neck and midbody and

15 before vent. Ventrals 166; subcaudals 33, all but second to sixth divided. Reddish orange above, pinkish white beneath.

Total length, 470 millimeters; tail, 59.

The stomach of this specimen contained seven tarantulid spiders.

Distribution.—Eastern Bengal and Cambodia through Burma and Tonkin to Kwangtung, Fukien, and Hainan Island.

Local Hakka name.—Bu-kian Sa.

48. CALAMARIA SEPTENTRIONALIS Boulenger.

Calamaria septentrionalis BOULENGER, Proc. Zool. Soc. London (1890) 34, Kiu-kiang region and Hongkong.

A single female specimen (No. 23803, M. V. Z.) was procured in southeastern Kiangsi Province, Sungwu, altitude 450 meters, in July.

Description.—Small, of uniform diameter throughout; tail very short and blunt. Frontal as broad as long; prefrontals very large; no internasals, temporals, or loreal; supralabials 4—4; scales smooth, short, in 13 rows throughout; ventrals 175; anal entire; subcaudals 9. Brownish black above; ventral surface and an incomplete band on neck and another at base of tail, red; undersurface of tail black along middle.

Total length, 159 millimeters; tail, 6.

Distribution.—Anwei; Chekiang; Fukien; Kwangtung; Kiangsi; Hunan; Kwangsi; Hainan Island; Tonkin.

Local Hakka name.—Leong-teu Sa (two-headed snake).

HOMALOPSINÆ

49. ENHYDRIS CHINENSIS (Gray).

Hypsirhina chinensis GRAY, Zool. Misc. (1842) 66, China.

Ten specimens (Nos. 23813 to 23822, M. V. Z.) were collected: southwestern Fukien Province, 6 from Gang-keu, altitude 525 meters, July 24 to 27: southeastern Kiangsi Province, 2 from Hong San, altitude 825 meters, June 28 to 30: eastern Kwangtung Province, 2 from Mei-hsien (Kaying), altitude 220 meters, June 7 and 8, 1936.

Description.—Internasal single; oculars 1—2; temporals 1—2; supralabials 8; body scales in 23 to 25 rows anteriorly and 19 before vent; ventrals 142 to 154; subcaudals 40 to 51. Gray above with side of ventrals and subcaudals black along their anterior margins; supralabials black above, yellow below.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Sub-caudals.	Total length.	Tail length.	Locality.
23821	female	142	42	605	78	Mei-hsien.
23822	male	154	51	279	44	Do.
23814	female	142	40	281	37	Hong San.
23813	do	145	41	454	56	Do.
23816	do	144	42	387	51	Gang-keu.
23815	male	149	44	303	42	Do.
23818	do	146	44	365	50	Do.

One stomach contained the remains of a frog, another those of a fish. No. 23821 contained twelve eggs 23 by 15 millimeters, with embryos measuring about 50 millimeters in length, still unpigmented. The ovaries of No. 23813 held five eggs, measuring 17 by 14 millimeters.

Distribution.—Eastern and southern China; Hainan Island; Formosa.

59. ENHYDRIS PLUMBEA (Boie).

Homalopsis plumbea BOIE, Isis (1827) 550, Java.

Ten specimens (Nos. 23844 to 23853, M. V. Z.) were collected: southwestern Fukien Provinces, 8 at Gang-keu, altitude 550 meters, July 24 to 26: southeastern Kiangsi Province, 2 at Hong San, altitude 625 to 750 meters, June 23 and July 17, 1936.

New to Kiangsi Province.

Description.—Internasal triangular; preoculars 2; anterior temporals single; posterior temporals 2 or 3; supralabials 8, first supralabial extending posteriorly above; body scales smooth, in 19 rows from neck to midbody, in 17, 16, or 15 before vent. Greenish black or greenish brown above, yellowish along middle of side and creamy white below, with a small black spot at middle of each ventral, median sutures of subcaudals black; labials largely white.

Measurements of selected specimens, in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Sub-caudals.	Total length.	Tail length.	Locality.
23844	female	127	35	300	35	Hong San.
23845	do	129	38	201	26	Do.
23846	do	125	37	320	29	Gang-keu.
23851	do	127	37	328	39	Do.
23852	male	126	41	279	38	Do.
23853	female	126	36	289	38	Do.

Contents of three stomachs included a *Rana limnocharis*, a fish, and a crustacean (?) respectively. The ovaries of No. 23846 contained eggs with five young measuring 89 to 92 millimeters in length, fairly well pigmented.

Distribution.—Chekiang; Kiangsi; Fukien; Kwangtung; Hainan Island; Formosa; Burma and Tonkin, south into the Malay Archipelago.

Local Hakka name.—*Mei Sa.*

BOIGINÆ

51. BOIGA MULTOMACULATA (Boie).

Dipsas multomaculata BOIE, Isis (1827) 549, Java.

Four specimens (Nos. 23865 to 23868, M. V. Z.) were collected: southwestern Fukien Province, 1 at Gang-keu, altitude 575 meters, July 25, 1936; eastern Kwangtung Province, 2 at Mei-hsien, altitude 220 meters, in the summer of 1935 by Miss Erichson, and in June, 1936, by the Rev. Mr. David M. Campbell, respectively; 1 at Kakchieh, Swatow, altitude 50 meters, July, 1936, by the Rev. Mr. A. H. Page.

Description.—Slender, anterior portion of body and neck very narrow, head broad; tail slender. Preoculars single in three specimens, double in one; postoculars 2; anterior temporals 2; posterior temporals 3; supralabials 8; body scales in 19 or 20 rows on neck, 19 at midbody and 13 or 14 before vent, vertebral row slightly enlarged; ventrals 197 to 203; subcaudals 82 to 90. Light speckled brown, with a row of large, transverse, dark-brown spots on either side, with irregular rows of smaller spots on lower sides and ventral surface; head with an arrow-shaped mark on top and a dark laterial line; labials dark, edged posteriorly with brown.

Measurements of 4 males, in millimeters.

M. V. Z. No.	Ventrals.	Subcaudals.	Total length.	Tail length.	Locality.
23865	200	90	403	84	Gang-keu.
23866	197	----------	620	(97)	Mei-hsien.
23867	203	82	490	95	Do.
23868	197	87	370	74	Swatow.

The stomach of the specimen from Swatow contained the remains of a gecko (*Hemidactylus bowringii*).

Distribution.—Fukien; Kiangsi; Kwangsi; Kwangtung; Hainan Island; Bengal and Burma to Celebes.

Local Hakka name.—*Bak-po-chen.*

ELAPIDÆ

52. BUNGARUS MULTICINCTUS MULTICINCTUS Blyth.

Bungarus multicinctus BLYTH, Journ. Asiat. Soc. Bengal 29 (1861) 98, Amoy.

Three specimens (Nos. 23872 to 23874, M. V. Z.) were obtained: eastern Kwangtung Province, two half-grown specimens at Mei-hsien (Kaying), altitude 225 meters, June 9 and 17; southeastern Kiangsi Province, 1 adult near Tai-au-hong, altitude 580 meters, July 6, 1936.

Description.—Body slender, deeper than wide; middorsal scale row enlarged and raised; head narrower than body at middle, very little wider than neck. Loreal absent; eyes shorter than one-half their distance from snout, pupil subcircular; oculars 1—2; labials 7; body scales smooth, in 15 rows from neck to vent. Body shiny bluish black above with many narrow, creamy-white bands; ventral surfaces dull cream, broadly banded with black on tail, ventrals irregularly speckled in the two larger specimens.

Measurements of 3 females, in millimeters.

M. V. Z. No.	Ventrals.	Subcaudals.	Total length.	Tail length.	White bands on—	
					Body.	Tail.
23872	215	49	670	71	42	14
23873	209	51	623	80	35	11
23874	206	50	1,120	134	35	10

The stomach of No. 23873 contained the remains of an eel over 200 millimeters long. One of the smaller specimens, released accidentally in a room in daylight, was exceedingly active in trying to escape.

Distribution.—Chekiang; Fukien; Kiangsi; Kwangtung; Hunan; Hupeh; Kwangsi; Hainan Island; Formosa.

Local Hakka name.—Bo-ki-kap.

English name.—Chinese krait.

53. NAJA NAJA ATRA Cantor.

Naja atra CANTOR, Ann. & Mag. Nat. Hist. (1842) 482, Chusan Island.

Five specimens were taken (Nos. 23883 to 23887, M. V. Z.), all in eastern Kwangtung Province: 2 at Mei-hsien city (Kaying), altitude 225 meters, June 8 and 9; 1 at Yim-na San, altitude 550 meters, June 21, and 2 at Kakchieh, Swatow, altitude 50 meters, July 27 and August 9, 1936.

Description.—Rostral triangular; internasal suture shorter than prefrontal; parietals very broad, emarginate posterolaterally; nostril vertical; loreal absent; preoculars single; postoculars 1 (5 specimens), 2 (3 specimens), or 3 (2 specimens); anterior temporals 2; posterior temporals 2 on each side in two specimens, 2 on one side and 3 on other in three; body scales in 24 to 26 rows on neck, 21 or 20 rows at midbody, and 15 or 16 rows before vent; ventrals 157 to 173; subcaudals 45 to 50. Black, narrowly and distinctly banded with white; back of spreading neck with white spectacles or a mask; anterior ventrals white, remainder iridescent silvery black.

Measurements in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Sub-caudals.	Total length.	Tail length.	Bands.	Locality.
23884	male	157	47	522	82	17	Mei-hsien.
23885	do	168	48	519	78	22	Do.
23883	female	173	--------	1,015	(139)	17	Yim-na San.
23886	do	174	--------	656	(93)	11	Swatow.
23887	male	165	50	1,065	161	6	Do.

Two stomachs contained a young *Bufo melanostictus* and the skull of a fish, respectively.

Distribution.—Kwangsi; Hunan; Kiangsi; Chekiang; Fukien; Kwangtung; Hongkong; Hainan Island; Formosa; Tonkin.

Local Hakka name.—*Fan-chok Sa* (rice-ladle snake).

English name.—Chinese cobra.

AMBLYCEPHALIDÆ

54. AMBLYCEPHALUS KUANGTUNGENSIS Vogt.

Amblycephalus kuangtungensis Vogt, Archiv Naturg. 88 A 10 (1922) 141; Mell, ibid., 125.

A single specimen (No. 23890, M. V. Z.), a juvenile, was taken in eastern Kwangtung Province, Tai-yong, altitude 660 meters August 6, 1936.

Description.—Neck slender; head large, subrectangular; snout short, broad, truncate. Preoculars 3—2; postoculars 3—3; anterior temporals 2—2; posterior temporals 3—3; supralabials 6—6; body scales 14—14—14; scales of two middle rows enlarged; ventrals 184; subcaudals 69. Pale whitish tan, with about 48 irregular, transverse, narrow, dark-brown bands on each side of body and about 30 less regular bands on tail; snout and labials white; top of head mottled black; ventrals dirty cream, sparsely and finely dotted with dark brown.

Total length, 179 millimeters; tail, 39.

The stomach contained remains which were probably those of a small slug.

Distribution.—Fukien; Kwangtung; Kwangsi.

CROTALIDÆ

55. TRIMERESURUS ALBOLABRIS Gray.

Trimeresurus albolabris Gray, Zool. Misc. (1842) 48, China.

Three specimens were collected (Nos. 23901 to 23903, M. V. Z.) southwestern Fukien Province, 2 at Gang-keu, altitude 540 meters, July 27 and 28; eastern Kwangtung Province, 1 at Tai-yong, altitude 650 meters, August 4, 1936.

Description.—Body short; neck slender; head broad behind; internasals and supraoculars large, remaining scales on top of head very small; first labial partly fused with nasal; second supralabial forming anterior border of pit; third supralabial largest; supraoculars separated by 9, 10, and 11 scales, respectively; body scales keeled, in 21, 23, and 25 rows on neck, 21 at midbody, and 15 before vent. Green above, with many indistinct black bands on dorsum; greenish white below with a longitudinal white line on each side commencing on rostral and extending along side of head, touching lower edge of eye, and along upper portions of first scale row on body.

Measurements in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Subcaudals.	Total length.	Tail length.	Locality.
23901	male	161	63	419	70	Gang-keu.
23902	do	158	....	415	(71)	Do.
23903	female	165	52	685	93	Tai-yong.

The stomachs of the two Gang-keu specimens contained remains of frogs, probably of *Rana limnocharis*.

Distribution.—Fukien; Kwangsi; Kwangtung; Hongkong; Hainan Island; Formosa.

Local Hakka name.—*Tsuk Sa.*

56. TRIMERESURUS MUCROSQUAMATUS (Cantor).

Trigonocephalus mucrosquamatus CANTOR, Proc. Zool. Soc. London (1839) 32, Assam.

Four specimens were collected (Nos. 23908 to 23911, M. V. Z.): southwestern Kiangsi Province, 3 from Hong San, altitude

850 to 1,050 meters, June 27 and 30 and July 16: southern Kiangsi Province, 1 from Ng-tze San, altitude 675 meters, above Wong-sa-shue, July 9, 1936.

Description.—Body fairly long; neck slender; head broad behind, narrowed before middle; scales on top of head small, 15 or 14 in a row between supraoculars; several scales between nasal and "pit"; pupil vertical; fangs long, two on left side in No. 23908. Pinkish brown to rusty brown, with 60 to 70 bands, each consisting of a large dorsal, and a pair of smaller, lateral, dark-brown spots which are blackish near their edges and partly margined with white. The smallest specimen is pale pinkish tan on top of head, the largest rusty brown.

Measurements in millimeters.

M. V. Z. No.	Sex.	Ventrals.	Subcaudals.	Total length.	Tail length.	Body scales at—		
						Neck.	Middle.	Vent.
23908	female	210	85	828	142	27	25	19
23909	male	212	90	696	123	27	25	19
23910	female	218	77	890	135	27	25	19
23911	do	210	84	408	69	28	28	21

The stomach of No. 23910 held a large rat. No. 23908 was found under a boulder in a jungle at 1,050 meters altitude. It refused to strike when captured. Its stomach contained the remains of a rodent with a tail 165 millimeters long. No. 23911 was found under a pile of brushwood by a house. This species was not mentioned from Kiangsi by Pope in 1935, and was first recorded from this province by M. L. Y. Chang in 1934.

Distribution.—Fukien; Kiangsi; Kwangtung; Kwangsi; Szechwan; Formosa; Tonkin; Burma; Assam.

TESTUDINATA

PLATYSTERNIDÆ

57. PLATYSTERNON MEGACEPHALUM Gray.

Platysternon megacephalum GRAY, Proc. Zool. Soc. London (1831) 107, China.

Three specimens (Nos. 23926 to 23928, M. V. Z.) are in the collection: southern Kiangsi Province, 1 from Tai-au-hong, altitude 700 meters, July 5: eastern Kwangtung Province, 2 from Tai-yong, altitude 640 meters, August 4. An additional specimen, original No. 883, was procured in southern Kiangsi Province, Hong San, altitude 660 meters, June 23, but died and was eaten by a servant at Sungwu during my trip to Tai-au-hong.

New to Kiangsi Province.

Description.—Body dorsoventrally strongly compressed; carapace oblong, rather plane, weakly unicarinate; head very large, one-half as broad as, and nearly one-half as long as, carapace; slightly emarginate posteriorly; tail nearly as long as carapace. Brown above, mottled with yellow-brown and black; plastron dirty yellow-brown; head streaked above; moderate-sized specimens with head spotted with orange-brown laterally and ventrally, and with neck, legs, and underside of base of tail spotted with pink or dirty white. Small specimen with a dirty white, black-edged stripe from eye to neck; lower parts of head and neck pale, with black dots.

Measurements in millimeters.

M. V. Z. No.	Carapace.		Shell depth.	Platron length.	Tail length.	Locality.
	Length.	Breadth.				
23926	122	91	36	99	110	Tai-au-hong.
23927	100	69	28	87	93	Tai-yong.
28928	125	84	37	101	120	Do.

Original No. 883 from Hong San (lost) measured about 180 millimeters in length of carapace, which is near the maximum size for this species, No. 1482 was taken to the United States alive, but died after nearly five months, having refused to eat snails or earthworms, which are part of its normal diet.

Distribution.—Kwangtung; Kwangsi; Kiangsi; Fukien; Indo-China; Siam; southern Burma.

Local Hakka name (Tai-yong).—*Bak-lo-kui.*

TESTUDINIDÆ

58. CYCLEMYS TRIFASCIATA (Bell).

Sternothærus trifasciatus BELL, Zool. Journ. Lond. 2 (1825) 305, pl. 14 (13).

A single female specimen (No. 23933, M. V. Z.) was brought at Swatow, Kwangtung Province, August 28. An additional specimen was seen in the same market.

Description.—Carapace broader behind, feebly tricarinate; plastron notched posteriorly, hinged laterally and between pectoral and abdominal plates. Head yellow above, below and on lower parts of sides, upper lateral portion dark brown, a yellow-brown stripe passing through eye; carapace dull brown, carinæ black; plastron black, margins partly yellow, median area yellow-brown.

Measurements.—Length of carapace, 127 millimeters; width of carapace, 94; depth of shell, 47; length of plastron, 119; length of tails, 25.

Distribution.—Kwangtung, Hainan Island, Kwangsi.

59. CLEMMYS BEALEI (Gray).

Cistudo bealei GRAY, Synop. Rept. (1831) 71, China.

A single male specimen (No. 23936, M. V. Z.) of this rare species was purchased at Gang-keu, southwestern Fukien Province, July 22.

Description.—Carapace feebly unicarinate, broader behind; plastron transversely truncate anteriorly, slightly emarginate posteriorly, anal suture slightly longer than pectoral and femoral, and nearly as long as abdominal, suture. Head with four eyelike spots on temporal region, anterior spot on each side oval, vaguely defined, olive-brown, with one central, and several peripheral, black spots, posterior "eye" round, red, with black center; sides and anterior portion of head olive with black vermiculations; maxilla and mandible vertically streaked with yellow; neck with three dorsal, and many ventral, red stripes; legs brown above, yellowish white below; carapace olive-green, streaked or spotted with black anteriorly, more brownish near posterior end; plastron pinkish with a very few brown streaks. The red and pinkish changed to dirty yellow in alcohol. The shell of this specimen could hardly be said to be vermiculated, particularly below.

Measurements.—Length of carapace, 118 millimeters; breadth of carapace, 85; depth, 38; length of plastron, 102, tail, 31.

Distribution.—Fukien Province.

60. CLEMMYS MUTICA (Cantor).

Emys muticus CANTOR, Ann. & Mag. Nat. Hist. 9 (1842) 482, Chusan Island, Chekiang.

Two specimens (Nos. 23937 and 23938, M. V. Z.) were purchased at Swatow, Kwangtung Province, August 28. This species was most numerous among a lot of hard-shelled turtles brought to me there. The two bought were the largest and smallest, respectively, of the lot. This species has not previously been recorded from Kwangtung Province, and is not known from Fukien Province. No. 23937 had evidently been previously kept in captivity, as one of its hind legs had been amputated and healed. Though this might suggest introduction, the species is quite likely indigenous, as it has already been recorded from Hainan Island and Formosa.

Description.—Larger specimen, 23937: Carapace oblong-oval, nearly as broad anteriorly as posteriorly, feebly unicarinate, flattish in middle, second and third neural plates nearly rectangular; plastron concave in middle, truncate anteriorly and strongly emarginate posteriorly, longitudinal sutures not varying much in length, abdominal suture longest. Greenish olive on top of head, yellowish white below, a greenish yellow stripe extending back from eye; legs black above; shell largely black, carapace partly brownish at sides, plastron with a few yellow splotches. Smaller specimen, 23938: Carapace serrate behind, with a strong median, and feeble lateral, carinæ, three middle neurals strongly angulate laterally; plastron slightly emarginate anteriorly, deeply so posteriorly. Color of head as in 23937; carapace chocolate-brown; plastron dirty yellow, each plate with a large, brownish-black blotch on outer part, touching posterior margin; tail light with sides grayish black.

Measurements, 23937 and 23938, respectively.—Length of carapace, 187, 115 millimeters; width of carapace, 132, 83; depth, 53; length of plastron, 163, 101; tail, 33, 31.

Distribution.—Anhwei; Kiangsu; Chekiang; Kwangtung; Formosa; Hainan Island.

61. GEOCLEMYS REEVESI (Gray).

Emys Reevesi GRAY, Synop. Rept. (1831) 73, China.

A single specimen (No. 23939, M. V. Z.), a male, was taken from a swimming pool at Kakchieh, across the river from Swatow, eastern Kwangtung Province, August 27.

Description.—Body fairly deep; carapace oblong-oval, slightly broader posteriorly, plastron truncate anteriorly, deeply emarginate posteriorly, abdominal plates longest. Head grayish green with two narrow, longitudinal, slightly sinuous yellow stripes on each side, the upper stripe continued onto neck; tympanum bordered with a similar line; throat spotted, undersides of neck striped with yellow; carapace reddish brown; plastron blackish brown, sutures narrowly yellow; legs largely gray with a few yellow spots.

Measurements.—Length of carapace, 154 millimeters; breadth, 106; depth, 65; length of plastron, 144; tail, 30.

Distribution.—Most of China (perhaps introduced into the South from the North); Korea; southern Japan.

62. OCADIA SINENSIS (Gray).

Emys sinensis GRAY, Proc. Zool. Soc. London (1834) 53, China.

A single specimen (No. 23943, M. V. Z.), a female, was purchased at Swatow, eastern Kwangtung Province. Additional captive specimens were seen there.

Description.—Carapace oval, strongly arched, broadest behind middle, tricarinate, lateral carinæ feeble; plastron transversely subsinuate-truncate anteriorly, rounded-emarginate posteriorly, abdominal plates largest. Head and neck black, longitudinally striped with yellow, except on middle of top of head, sides of head broadly striped, gula and ventral surface of neck pale yellow with fine black lines; carapace dull reddish brown, sutures black; plastron dirty yellowish white, each plate with central portion light chocolate brown; legs and tail largely black with yellow stripes above, and yellow, striped, or ocellated, below, with black.

Measurements.—Length of carapace, 153 millimeters; breadth, 110; depth, 57; length of plastron, 141; tail, 46.

Distribution.—Formosa; Hainan; Kwangtung; Annam.

TRIONYCHIDÆ

63. TRIONYX SINENSIS Wiegmann.

Trionyx (Aspidonectes) sinensis WIEGMANN, Nova Acta Leop. Carol. 17 (1835) 189, small Island in Tiger River, near Macao.

Eleven specimens (Nos. 23947 to 23957, M. V. Z.) were taken: eastern Kwangtung Province, 2 purchased at Mei-hsien (Kaying, Moejen), altitude 230 meters, May 30: southeastern Kiangsi Province, 7 (23947 to 23953), purchased near Hong San, altitude 600 meters, June 21: southwestern Fukien Province, 2 carapaces (23954 and 23955), procured between Shanghang and Liung-chon San and at Gang-keu, respectively, in July. No. 23956 was skeletonized. Fukien Province, 3 very nearly spherical, white, hard-shelled eggs, measuring 19 to 20.5 millimeters in diameter, were brought to me at Gang-keu, July 24. They contained no evident embryos.

Description.—Nostrils produced into a fleshy snout; lips fleshy; neck granulated; body greatly depressed; bony carapace covered with a fleshy dorsal shield (disc) extending beyond ribs; plastral bones incomplete, loosely jointed, covered with skin; disc with a raised anterior margin, sublongitudinally ridged over most of surface with rows of narrow tubercles, more prominently in smaller individuals, skin covering bony carapace closely vermiculated, skin behind carapace grossly and densely tuberculate. Largely putty-gray above and white beneath, bluish or mottled on underside of head, neck, hands, and feet. Even the smallest specimen (72 millimeters) lacks the black ventral blotches characteristic of juveniles from farther north.

Measurements of 9 specimens, in millimeters.

M. V. Z. No.	Sex.	Carapace length.	Disc.		Depth of body.	Plastron length.	Tail, from leg.
			Body length.	Width.			
23954	....	132	....	....	....	....	....
23948	....	110	169	127	33	121	67
23850	....	77	123	98	37	109	39
23947	female	70	117	90	31	93	36
23949	male	70	115	89	23	89	48
23957	....	70	110	78	29	89	31
23952	....	57	94	76	24	75	31
23953	....	56	90	74	24	75	26
23951	male	43	72	61	18	60	23

Distribution.—All of China except the highest parts in the west; Hainan; Formosa; probably also Japan and eastern Siberia.

Local Hakka name.—Toi-ng.

ILLUSTRATION

PLATE 1

[Drawing prepared by T. P. Maslin.]

Natrix boulengeri Gressitt, 23623, M. V. Z., female, from Tai-yong, altitude 540 meters, eastern Kwangtung Province. Tracings on photographs. × 3 ½. FIG. 1, dorsal view of head; *2*, ventral view of head; *3*, lateral view of head.

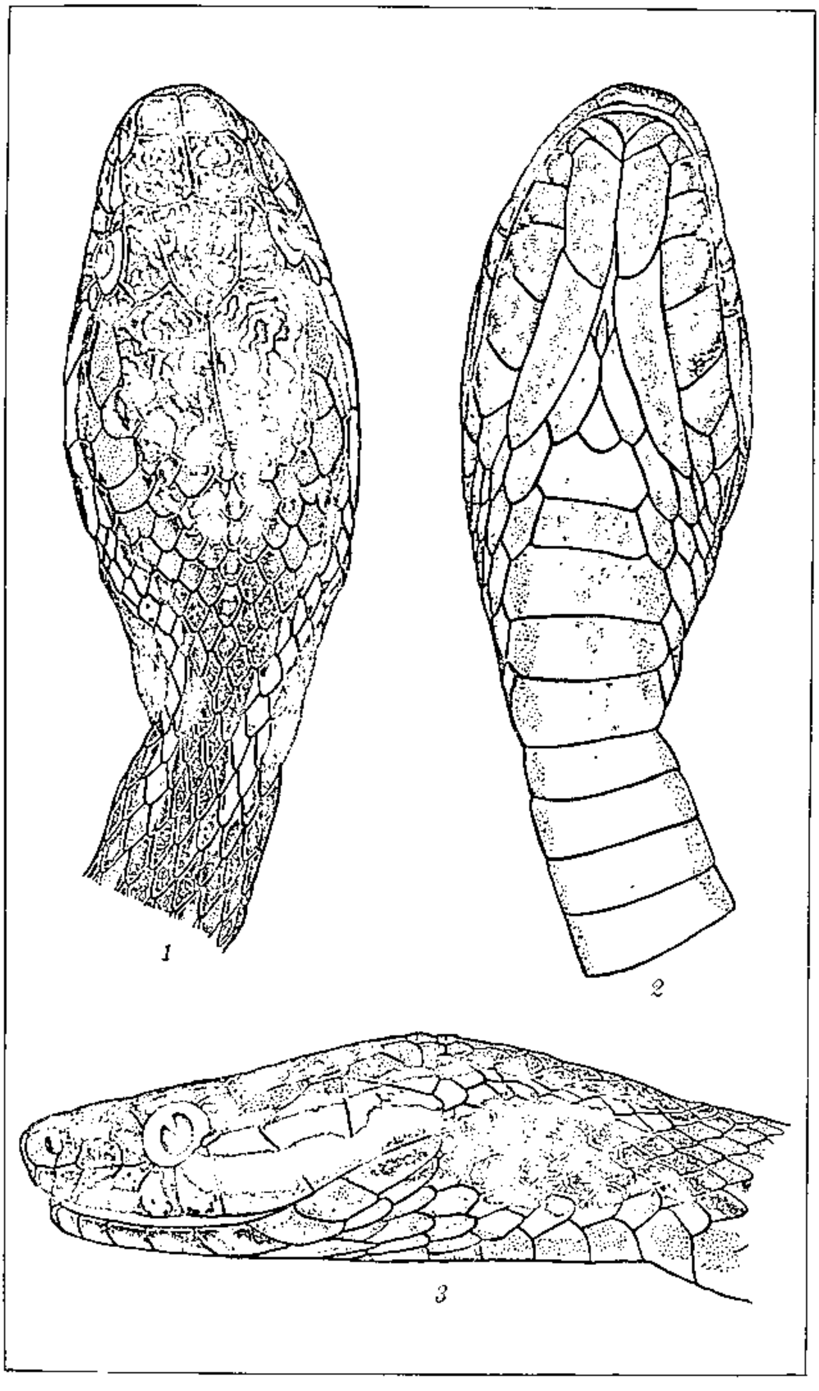


PLATE. 1. NATRIX BOULENGERI GRESSITT.

THE HORNETS OF THE PHILIPPINES

HYMENOPTERA, DIPLOPTERA, VESPINÆ

By J. BEQUAERT

Of the Museum of Comparative Zoology, Harvard University, Cambridge

The hornets of the Indo-Malayan Region belong to two genera, differing as shown in the following key.

Key to the Indo-Malayan genera of hornets.

Head small, outer orbits narrow, vertex short; posterior ocelli placed about as far from occiput as from eyes. Ocelli very large, close together. First abdominal segment cup-shaped, tergite convex and broadly rounded off anteriorly .... *Provespa.*

Head very large, outer orbits broad, vertex long; posterior ocelli placed at least three times as far from occipital margin as from eyes. Ocelli normal, exceptionally somewhat swollen. First abdominal segment transverse, tergite truncate and abruptly sloping anteriorly.... *Vespa.*

Provespa Ashmead includes three species of nocturnal habits and is known definitely from Sikkim, Bhutan, Burma, Tenasserim, Malacca, Siam, Cambodia, Cochin-China, Sumatra, and Borneo. The occurrence in Celebes is doubtful and, according to J. van der Vecht,[1] this genus does not exist in Java. Ashmead included *Provespa anomala* (de Saussure) (Syn.: *doryl-loides* de Saussure) in his lists of the Hymenoptera of the Philippines,[2] but there is no evidence that this hornet was ever taken there. There is no specimen from the Islands in any of the collections I have studied. As these nocturnal wasps are attracted by artificial light, they could scarcely be overlooked.

Genus VESPA Linnæus

The hornets of the Philippines belong to three structural species, separable by the following key.

---

[1] Entom. Meded. Nederl.-Indië 1 (1935) 41.

[2] Journ. New York Ent. Soc. 12 (1904) 7; Proc. U. S. Nat. Mus. 28 (1904) 151.

Key to the Philippine species of Vespa.

1. Lower margin of eye far from base of mandible; intervening oculomalar space about length of fifth antennal segment in female and worker, about half length of fourth antennal segment in male. Clypeus of female and worker with a deep arcuate excision at apex and prominent, bluntly triangular edges .... *V. tropica.*

   Lower margin of eye much nearer base of mandible; intervening oculomalar space at most half length of sixth antennal segment in female and worker, at most half length of seventh antennal segment in male. Clypeus of female and worker arcuately excised at apex, but edges very broad and evenly rounded off........ 2.

2. Clypeus coarsely punctate all over in both sexes. Eyes about as far apart at vertex as at clypeus. Ocelli of normal size, posterior pair smaller than their interval .... *V. affinis.*

   Clypeus more superficially and sparsely punctate in both sexes. Eyes somewhat farther apart at clypeus than at vertex. Ocelli somewhat swollen, posterior pair slightly larger than their interval. *V. luctuosa.*

Two of these species are represented in the Philippines by more than one color form, there being nine such forms (or races) of hornets in the Archipelago. For easy identification it may be more practical to compare them in one general key.

Key to the Philippine subspecies of Vespa.

1. Thorax and abdomen wholly or almost wholly black; postscutellum black; at most a narrow pale line at apex of second, more rarely at apex of first and second tergites; head black .... 2.

   Head, thorax, and abdomen not wholly nor almost wholly black; abdomen partly orange-yellow, or several of the tergites with pale apical bands, or postscutellum with pale marking, or head partly pale .... 3.

2. Wings uniformly yellowish-russet, only slightly darker close to costa. *V. tropica* var. *deusta.*

   Wings very strongly infuscate (almost black) in basal half; apical portion yellowish russet........ *V. tropica* var. *anthracina.*

3. One or more of first three abdominal tergites extensively orange-yellow or ferruginous. Head and thorax black or with some ferruginous blotches .... 4.

   Abdomen without orange-yellow or ferruginous; usually some of tergites margined with pale or dark yellow. Head partly yellowish. Postscutellum partly or mostly yellowish .... 6.

4. First three abdominal tergites with very broad orange-yellow apical margins (rarely fourth also with apical fascia); sternites almost wholly black .... *V. tropica* var. *philippinensis.*

   Second or first and second abdominal tergites mostly orange-yellow.... 5.

5. First and second abdominal tergites mostly orange-yellow. Structural characters of *V. affinis* .... *V. affinis* var. *indosinensis.*

Only second tergite and sternite mostly orange-yellow; first tergite rarely with small orange apical spots or narrow margin. Structural characters of *V. tropica* .... *V. tropica* var. *tropica*.

6. Thorax black, except for partly or wholly yellowish postscutellum and sometimes a narrow margin on pronotum. Apical yellowish margins of tergites narrow and regular .... 7.

Thorax more extensively yellowish; in addition to postscutellum, propodeum also marked with yellowish. Apical yellowish margins of tergites wider and more or less notched anteriorly .... 8.

7. Sixth abdominal tergite black.......................... *V. luctuosa* var. *luctuosa*.

Sixth abdominal tergite mostly or wholly yellowish.
V. luctuosa var. *semperi*.

8. Thorax moderately marked with yellow; scutellum as a rule wholly black. All tergites margined with yellowish, sixth tergite either partly or wholly yellowish .... *V. luctuosa* var. *bellicosa*.

Thorax extensively marked with yellowish; scutellum spotted with yellowish. Only first four tergites of abdomen broadly margined with yellowish, remainder black or fifth tergite narrowly margined .... *V. luctuosa* var. *luzonensis*.

VESPA TROPICA (Linnæus).

I have recently discussed the characters and color forms of this widely distributed Oriental hornet, which has often been confused with *V. affinis*.[3] Of the twelve color forms that I recognize four occur in the Islands, but one of these has been found only in the Sulu Archipelago.

VESPA TROPICA var. TROPICA Bequaert.

Sphex tropica Linnæus, Syst. Nat. 10th ed. 1 (1758) 571, "in Indiis."
Vespa tropica var. *tropica* Bequaert, Treubia pt. 4 15 (1936) 337.
Vespa cincta Fabricius, Syst. Entom. (1775) 362, Malabar.

I have seen two specimens of the typical form from the Sulu Islands; Bud Dajo, Jolo, 1; and Bongao (Tawitawi), 1. It is unknown at present from the rest of the Philippines.

The typical form is common in Tenasserim, Assam, Sikkim, Tonkin, Indo-China, Siam, Penang, Sumatra, Nias, Banka, Billiton, Java, Lombok, Madoera, Amboina, and Borneo.

VESPA TROPICA var. DEUSTA Lepeletier.

Vespa deusta Lepeletier, Hist. Nat. Ins. Hym. 1 (1836) 506, female, no locality; de Saussure, Et. Fam. Vesp. 2 (1854) 149, female; Smith, Cat. Hym. Brit. Mus. 5 (1857) 121; Dalla Torre, Cat. Hym. 9 (1894) 145; Gen. Insect. Vesp. (1904) 65; Ashmead, Journ. New York Ent. Soc. 12 (1904) 7, Bacoor; Proc. U. S. Nat. Mus. 28 (1904) 151; du Buysson, Ann. Soc. Ent. France pt. 3 73 (1904) 489, 528, 2 females, Mindanao, Luzon (Albay, Manila,

---

[3] Treubia pt. 4 15 (1936) 333–345.

Mount Arayat), Palawan (Puerto Princesa); WILLIAMS, Expt. Sta. Hawaiian Sugar Planters' Assoc. Ent. Ser. Bull. 14 (1919) 165, fig. 95, female, Los Baños, Luzon; Philip. Journ. Sci. 35 (1928) 78.

Vespa tropica var. *deusta* BEQUAERT, Treubia pt. 4 15 (1936) 341, 2 females and 1 male.

Vespa unicolor SMITH, Journ. Proc. Linn. Soc. London Zool. 7 (1863) 44, female, Buru.

Specimens examined.—LUZON, Manila, (*R. C. McGregor*): Laguna Province, Los Baños (*Coll. Agric.; Philip. Bur. Sci.*); Mount Maquiling, up to 1,000 meters (*Coll. Agric.*); Mount Banahao (*Philip. Bur. Sci.*): Tayabas Province, Atimonan (*Philip. Bur. Sci.*): Camarines Sur Province, Mount Isarog (*M. B. Mariano; Philip. Bur. Sci.*): Nueva Vizcaya Province, Bayombong (*Coll. Agric.*): La Union Province, San Juan (*J. Fontanilla; Coll. Agric.*): Rizal Province, Novaliches (*W. Schultze; Philip. Bur. Sci.*). MINDORO, Calapan (*P. de Mesa*); Mount Halcon (*E. D. Merrill; Philip. Bur. Sci.*); Puerto Galera (*S. M. Cendaña; Coll. Agric.*); Lubang (*P. de Mesa*).

Also known from Celebes, Buru, and Dutch New Guinea. The supposed occurrence in Sumatra is doubtful.

Some of the records from the Philippines in the literature listed above (particularly du Buysson's record Mindanao) are probably based on a specimen of var. *anthracina*, which was until recently confused with var. *deusta*.

VESPA TROPICA var. ANTHRACINA Bequaert.

Vespa tropica var. *anthracina* BEQUAERT, Treubia pt. 4 15 (1936) 341, 2 females and 1 male; type locality, Sibuyan.

Specimens examined.—Sibuyan (*C. F. Baker*). PALAWAN (or Paragua) (*Doherty*); Puerto Princesa (*R. C. McGregor; Philip. Bur. Sci.*); Iwahig (*Philip. Bur. Sci.*); Bacuit (*Prince Leopold of Belgium*). PANAY, Colasi (*R. C. McGregor*). MINDANAO, Surigao Province, Surigao (*C. F. Baker*): Davao Province, Calian (*C. F. Clagg*): Zamboanga Province, Dapitan. Not located: Bukidnon Province (*Philip. Bur. Sci.*).

From available records it would appear that, while var. *deusta* is common in the northern half of the Archipelago (Luzon, Mindoro, Lubang), it is replaced by var. *anthracina* in the southern half (Sibuyan, Panay, Palawan, Cebu, Mindanao). The latter form is not known outside the Philippines.

VESPA TROPICA var. PHILIPPINENSIS de Saussure.

Vespa philippinensis DE SAUSSURE, Et. Fam. Vesp. 2 (1854) 148, male, Philippines; SMITH, Cat. Hym. Brit. Mus. 5 (1857) 121; Journ. Proc. Linn. Soc. London Zool. 5 (1860) 131; 7 (1863) 44; DALLA TORRE, Cat. Hym. 9 (1894) 152; Gen. Insect. Vesp. (1904) 65; ASHMEAD, Journ. New York Ent. Soc. 12 (1904) 7, Baliwag; Proc. U. S. Nat. Mus. 28 (1904) 151; DU BUYSSON, Ann. Soc. Ent. France pt. 3 73 (1904) 489, 529, female, Mindanao.

Vespa tropica var. *philippinensis* BEQUAERT, Treubia pt. 4 15 (1936) 342, 2 females and 1 male.

Specimens Examined.—Luzon, Laguna Province, Los Baños (*C. P. Dolores; Philip. Bur. Sci.*). SAMAR, Mauo River (*Prince Leopold of Belgium*); Oquendo (*Philip. Bur. Sci.*). NEGROS, Occidental Negros Province, Maao (*C. S. Banks; Philip. Bur. Sci.*); Canlawan (*C. S. Banks; Philip. Bur. Sci.*). MINDANAO, Surigao Province, Surigao (*C. F. Baker*). Not located, Ubay (*Semper*).

F. Smith's records of this form from Buru and Amboina need confirmation.

VESPA AFFINIS (Linnæus).

This species, often confused with *V. tropica* (*V. cincta* of authors), was also revised in Treubia.[4] I recognized six color forms, only one of which is known from the Philippines.

VESPA AFFINIS var. INDOSINENSIS (Pérez).

Vespa unifasciata OLIVIER, Encyclop. Méthod. Insectes 6 (1791) 677, "Indes orientales;" not *V. unifasciata* Gmelin, 1790.

Vespa nigripennis DE SAUSSURE, Et. Fam. Vesp. 2 (1854) 156, female, Philippines; SMITH, Cat. Hym. Brit. Mus. 5 (1857) 121; DALLA TORRE, Cat. Hym. 9 (1894) 150; Gen. Insect. Vesp. (1904) 65; ASHMEAD, Journ. New York Ent. Soc. 12 (1904) 7; Proc. U. S. Nat. Mus. 28 (1904) 151; DU BUYSSON, Ann. Soc. Ent. France pt. 4 73 (1904) 620; not *V. nigripennis* de Geer (1773).

Vespa indosinensis PÉREZ, Actes Soc. Linn. Bordeaux 64 (1910) 8, (1910) 8, male or female, Cochin-China, Annam, Malacca, northern Celebes; India.

Vespa affinis var. *indosinensis* BEQUAERT, Treubia pt. 4 15 (1936) 349, 2 females and 1 male.

Specimens examined.—Samar, Mauo River (*Prince Leopold of Belgium*). PALAWAN (or Paragua), Biscuit (*Prince Leopold of Belgium*); Puerto Princesa (*R. C. McGregor; Philip. Bur. Sci.*); Iwahig (*C. M. Weber; Philip. Bur. Sci.*). DUMARAN (*W. Schultze; Philip. Bur. Sci.*). MINDANAO, Zamboanga Province, Zamboanga.

---

[4] pt. 4 15 (1936) 345–351.

The specimens from the Philippines (Luzon, Puerto Princesa) recorded by R. du Buysson under *V. cincta* var. *affinis* [5] were var. *indosinensis*. Ashmead includes *V. cincta* in one of his lists of Philippine Hymenoptera [6] but apparently he saw no specimens.

The var. *indosinensis* is widely distributed, being known also from Indo-China, the Federated Malay States, Sumatra, Simalur, Engano, Nias, Banka, Mentawei Archipelago, Borneo, Celebes, Ternate, Halmahera, Amboina, Salawatti, Aru, Waigeu, and New Guinea.

VESPA LUCTUOSA de Saussure.

In a recent paper [7] I recognized five color forms of this species, four of them known from the Philippines. The fifth form, *V. luctuosa* var. *malayana* Bequaert (= *V. annulata* Smith), occurs in Borneo and Sumatra.

VESPA LUCTUOSA var. LUCTUOSA (de Saussure).

Vespa luctuosa DE SAUSSURE, Et. Fam. Vesp. 2 (1854) 143, 1 male, Philippines; SMITH, Cat. Hym. Brit. Mus. 5 (1857) 121; DALLA TORRE, Cat. Hym. 9 (1894) 148; Gen. Insect. Vesp. (1904) 65; ASHMEAD, Journ. New York Ent. Soc. 12 (1904) 7, Bacoor; Proc. U. S. Nat. Mus. 28 (1904) 151; DU BUYSSON, Ann. Soc. Ent. France pt. 4 73 (1904) 619, 1 male; WILLIAMS, Expt. Sta. Hawaiian Sugar Planters' Assoc. Ent. Ser. Bull. 14 (1919) 164, Los Baños; Philip. Journ. Sci. 35 (1928) 78; BEQUAERT, Bull. Mus. R. Hist. Nat. Belgique (28) 10 (1934) 3, 2 females and 1 male.

Specimens examined.—LUZON, Laguna Province, Mount Maquiling (*C. F. Baker*); Mount Banahao (*C. F. Baker*); Los Baños (*Philip. Agric.*); Majayjay (*C. S. Banks; Philip. Bur. Sci.*): Rizal Province, Mount Pulo (*R. C. McGregor*): Tayabas Province, Gumaca (*Foxworthy; Philip. Bur. Sci.*); Kasiguran (*A. Duyag; Philip. Bur. Sci.*). MINDORO, Mount Halcon (*E. D. Merrill; Philip. Bur. Sci.*); Calapan (*P. de Mesa*). MINDANAO, Cotabato Province, Kolambugan (*C. S. Banks; Philip. Bur. Sci.*); Jalog River, Mount Apo, 6,000 feet (*C. F. Clagg*): Davao Province, Calian (*C. F. Clagg*). NEGROS, Oriental Negros Province, Dumaguete (*J. W. Chapman*): Occidental Negros Province, Maao (*C. S. Banks; Philip. Bur. Sci.*). TICAO (*R. C. McGregor; Philip. Bur. Sci.*). SAMAR, Oquendo (*Philip. Bur. Sci.*).

---

[5] Ann. Soc. Ent. France pt. 3 73 (1904) 536.

[6] Proc. U. S. Nat. Mus. 28 (1904) 151.

[7] Bull. Mus. R. Hist. Nat. Belgique (28) 10 (1934) 1–50.

Apparently distributed over the entire Archipelago and common everywhere, but not known outside the Philippines. The queens are much larger than the workers and much less marked with pale yellow (more ivory-white) on the abdomen; this wasp is sometimes entirely black or the first tergite only is narrowly margined. Often also there is only a narrow transverse pale-yellowish streak on the postscutellum.

VESPA LUCTUOSA var. SEMPERI du Buysson.

Vespa bellicosa var. *semperi* DU BUYSSON, Ann. Soc. Ent. France pt. 3 73 (1904) 542, 1 female, Comigu, Mindanao, Lubang, Luzon, Tayabas.

Vespa luctuosa var. *semperi* BEQUAERT, Bull. Mus. R. Hist. Nat. Belgique (28) 10 (1934) 4, female.

Specimens examined.—MINDANAO, Davao Province, Calian, (*C. S. Clagg*): Cotabato Province, Kolambugan (*C. S. Banks; Philip. Bur. Sci.*): Zamboanga Province, Zamboanga.

Var. *semperi* is not known outside the Philippines and seems to occur sporadically with typical *luctuosa*.

VESPA LUCTUOSA var. BELLICOSA de Saussure.

Vespa bellicosa DE SAUSSURE, Et. Fam. Vesp. 2 (1854) 146, pl. 14, fig. 10, 1 female, Java; DU BUYSSON, Ann. Soc. Ent. France pt. 3 73 (1904) 488, 489, 540, pl. 5, fig. 7, 2 females and 1 male.

Vespa luctuosa var. *luzonensis* BEQUAERT, Bull. Mus. R. Hist. Nat. Belgique (28) 10 (1934) 4, 1 female.

Specimen examined.—MINDANAO, Surigao Province (C. F. *Baker*). The specimen from Zamboanga, which I listed under *bellicosa* in 1934, was of the var. *semperi*.

Although very rare in the Philippines, this form is common in Borneo, Sumatra, and the Moluccas. It is also reported from Singapore.

VESPA LUCTUOSA var. LUZONENSIS Bequaert.

Vespa luctuosa var. *luzonensis* BEQUAERT, Bull. Mus. R. Hist. Nat. Belgique (28) 10 (1934) 5, 1 female, Luzon.

Specimens examined.—Luzon, holotype, 1 female, without definite locality (Berlin Mus.). Also several paratypes at the Berlin Museum, labelled "Philippines."

So far as known, this form is peculiar to the Archipelago.

THE TREATMENT OF SCHISTOSOMIASIS JAPONICA WITH FUADIN[1]

By **Marcos A. Tubangui** and **Pantaleon J. Aguila**
Of the Bureau of Science, Manila

Fuadin (also written as "fouadin")[2] has been employed extensively in Egypt by Khalil and his co-workers (2, 4, 5) along with tartar emetic for the control of schistosomiasis hæmatobia and schistosomiasis mansoni. Both drugs have been found to be effective, but fuadin is preferred because it is less toxic and can be injected intramuscularly without producing much pain. According to the literature, fuadin has not yet been extensively tried against schistosomiasis japonica, which is considered to be more dangerous and more fatal than either of the two Egyptian types of parasitism. For this reason and in view of the fact that we have been interested in finding a safe but reliable therapeutic agent for the control of Oriental schistosomiasis in the Philippines, we decided to test the drug on some cases of the disease which we encountered during an epidemiological survey in Mindoro Island during October, 1939.

DOSAGE AND METHOD OF ADMINISTRATION

The standard dose of 40 cc of fuadin recommended by Khalil and Betache (4) was given to each adult individual weighing approximately 60 kilograms. This dose was divided into nine injections and administered intramuscularly into the buttocks, alternately on both sides. The first dose was 1.5 cc of the solution, the second 3.5 cc and the rest 5 cc each. The first three injections were given at daily intervals, the rest at in-

---

[1] Aided by a grant from the National Research Council of the Philippines.

[2] The drug is labelled as a "brand of sodium antimony biscatechol disulphonate of sodium, the descriptive name of which is Stibophen." It is prepared as a clear, isotonic solution, each cc containing 0.063 gram of fuadin (= 8.5 milligrams of trivalent antimony).

We are very gratefully indebted to Mr. U. von Prittwitz, the manager of the Manila Branch of the Winthrop Chemical Company, Incorporated, for the supply of fuadin used in the treatment of the schistosomiasis japonica cases recorded in this paper.

tervals of two days. The dosage for children and emaciated persons was reduced proportionately according to their weights.

UNTOWARD EFFECTS OF THE DRUG

The majority of the cases treated lived quite far from our improvised laboratory in Sitio Borbocolon, Naujan, Mindoro, where the injections were given. They had, therefore, to walk several kilometers before and after receiving an injection. Except in the case of two male individuals who were weak and emaciated, the patients were allowed to continue with their regular occupations during the course of the treatment. Our object was to find out if the drug can be safely administered under such conditions and in places far removed from hospitals. To our knowledge not a single patient suffered sufficiently from any toxic effect of the drug to need special attention. The only inconveniences experienced were slight headache, transient rheumatic pains accompanied with fever, and in a few cases nausea and vomiting. These symptoms usually appeared following the first or second injection. After the sixth or seventh injection some of the patients began to feel the beneficial effect of the treatment.

RESULTS OF THE TREATMENT

A total of 34 cases received injections of fuadin, but only 19 completed the treatment. Of the latter, as shown in Table 1, 10, 52.6 per cent, were apparently cured. The success of the treatment was based on failure to find schistosome eggs by repeated examination of the fæces after the last fuadin injection. In several cases a marked improvement in the physical condition of the patient was very noticeable if the treatment was successful. In some individuals the lethal effect of fuadin on the schistosome parasite was not noted until several days after the administration of the last injection. In a few instances, however, the ova of the parasite disappeared as early as after the eighth injection or, if present, they were few in number and contained dead miracidia. One female patient became negative by fæcal examination for seven days after the last injection, but was again positive when examined two weeks later. This was probably a case of relapse.

TABLE 1. *Results of a complete course of treatment with fuadin on 19 individuals affected with schistosomiasis japonica.*

Patient.	Age.	Sex.	Result of fæcal examination.[a]			
			After 8th injection.	One day after 9th injection.	Seven days after 9th injection.	Twenty days after 9th injection.
G. A.	68	male	+	+	—	—
L. O.	56	do	+	±	—	—
J. V.	38	do	±	±	—	—
C. V.	16	female	+	+	+	+
M. M.	39	male	+	+	+	+
J. G.	12	do	+	+	+	+
N. R.	30	do	+	+	+	+
S. O.	14	do	+	+	+	+
S. G.	19	do	+	—	—	—
C. M.	42	do	+	+	+	+
F. V.	20	female	+	—	—	+
P. M.	13	male	—	—	—	—
E. E.	25	do	+	+	+	+
B. J.	28	do	±	—	—	—
F. V.	19	do	+	+	—	—
G. I.	14	do	+	+	—	—
R. A.	22	do	+	+	+	+
T. A.	26	female	+	—	—	—
P. C.	17	do	+	+	—	—

[a] +, positive for schistosome eggs; —, negative for schistosome eggs; ±, eggs with dead miracidia.

DISCUSSION

The results of our treatment compare favorably with those obtained at the Research Insitute of the Public Health Department of Egypt for the year 1934, as mentioned by Khalil.(3) In China, however, Kan and Yao(1) obtained a higher percentage of cures; namely, 68 per cent, against our 52.6 per cent. A question bound to be asked is why, if the drug is effective, a larger number of cases are not cured. There are two possible answers to this question, and one of them has to do with the fact that very advanced cases of schistosomiasis japonica, where the function of the liver is much impaired due to extensive cirrhotic changes, are probably beyond the capacity of any drug to cure. In our series there were two such cases, and they were among those who derived no apparent benefit from the treatment. The other reason may have something to do with the recent observations of Khalil,(3) who noted that the rapidity and degree of excretion of antimony from the body vary in different individuals, and that this variation may influence the therapeutic efficiency of the drug. There are persons who excrete the drug so rapidly that they need to be given repeated courses of the treatment before they can be cured. On the other hand, there are individuals who eliminate the drug very slowly and, if given the usual doses, are liable to suffer from its toxic effects and may even die. Between the two extremes are those persons who eliminate the drug at an average rate and for whom the standard course of treatment is sufficient to bring about a cure. In order, therefore, to obtain better and more uniform results and to guard against accidents that may be brought about by the toxic effect of fuadin, Khalil suggests that the dose be calculated, not according to age and weight, but according to the amount of the drug that can be retained in the body for a reasonable length of time. For this purpose he recommends the so-called "Fouadin test", by means of which the rate of excretion of the drug in the urine may be estimated at different intervals after the first injection. In the treatment of our cases, however, we were not able to perform this test due to lack of time and facilities.

SUMMARY AND CONCLUSIONS

1. A total of 19 cases of schistosomiasis japonica were given a complete course of treatment with fuadin. Of that number, 10, 52.6 per cent, were apparently cured. Of the 9 persons who were not cured, 1 had a relapse and 2 were very advanced cases.

2. As claimed by previous workers, the drug appears to be of value in the treatment of the disease. The suggestion of Khalil that the dose be calculated, not according to the age and weight of the patient, but according to his ability to retain the drug in the body during a reasonable length of time, should be given a trial in order to see whether by so doing the percentage of cures can be increased.

LITERATURE CITED

1. KAN, H. C., and Y. T. YAO. Some notes on the antischistosomiasis japonica campaign in Chih-Huai-fan, Kaihua, Chekiang. Chinese Med. Journ. 48 (1934) 323–336.

2. **KHALIL, M.** The specific treatment of human schistosomiasis (bilharziasis) with special reference to its application on a large scale. Arch. f. Schiffs-u. Tropen-Hyg. (Beihft. 2) 35 (1931) 1–128.

3. KHALIL, M. Individual variation in the excretion of drugs as an important factor in their therapeutic results. A practical method for detecting the schistosomiasis cases with so-called idiosyncrasy to antimony to avoid fatalities and complication. Journ. Egypt. Med. Assoc. **19** (1936) 285–305.

4. KHALIL, M., and M. H. BETACHE. Treatment of bilharziasis with a new compound "Fouadin." Report on 2041 cases. Lancet **1** (February 1, 1930) 234, 235.

5. KHALIL, M., M. NAZMI, F. M. PETER, M. SALAH EL DIN, and M. H. BETACHE. Die Behandlung der Schistosomiasis mit intramuskularen "Fuadin"-Injektionen. Deutsche med. Wochenschr. **55** (1929) 1125, 1126.

rious, especially in the absence of practical methods to ascertain readily the presence of Canton in a bale of abaca or commercial fiber.

Sherman[3] investigated Canton and reported that this fiber, compared with abaca of the same stripping, shows a lower tensile strength and percentage of elasticity but a higher acidity and percentage of ash.

Measurements of Canton fibers, made in this laboratory, are given in Table 1, which also includes the measurements of other fibers as reported by Fischer and Brown.[4]

TABLE 1.—*Dimensions of Canton and some other fibers.*

Sample.	Length.			Diameter.		
	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
Canton (*Musa* sp.)	6.80	2.63	4.02	0.022	0.011	0.0160
Abaca (*Musa textilis*)	6.00	3.98	2.45	0.021		0.0170
Plantain (*Musa sapientum* var. *paradisiaca*)	7.30	5.49	4.15	0.026	0.018	0.0200
Maguey (*Agave cantula*)	4.93	2.38	1.00	0.026	0.005	0.0180
Cogon grass (*Imperata exaltata*)	1.82	0.99	0.46	0.021	0.005	0.0110
Talahib grass (*Saccharum spontaneum*)	2.82	1.59	0.80	0.020	0.012	0.0150
Bamboo (*Bambusa blumeana*)		1.81				0.0075
Dwarf bamboo (*Bambusa lumampao*)	4.10	2.57	1.20	0.028	0.005	0.0156
Rice straw (*Oryza sativa*)		0.88				0.0025
Buri palm (*Corypha elata*)	2.80	2.11	1.10	0.015	0.010	0.0130

As shown in Table 1, the measurements of Canton compare favorably with those of abaca and other fibers.

MATERIAL

The material used for this investigation consisted of eight full-grown stalks obtained from Albay Province through the courtesy of the Director of Plant Industry. These green stalks were 16 months old and about 6.5 feet long. They consisted principally of water, which amounted to 95 per cent of the total weight.

The sheaths of each stalk were separated, split into strips about ½ inch wide, and dried in the sun for three weeks. For the estimation of the various chemical constants of the plant about two pounds of the air-dried sheaths were shredded and screened to render the sample as uniform in size as possible. The portion passing a 40-mesh screen and retained on a 60-mesh screen was used for the analysis. For digestion the air-dried sheaths were cut into ½ inch lengths so they could be conveniently charged into the autoclave.

---

[3] Sherman, H. E. Some chemical differences between abaca and canton fibers. Philip. Journ. Agr. 1 (1930) 123.

[4] Brown, W. H. Minor Products of Philippine Forests. 1. Bureau of Printing, Manila (1920) 415.

EXPERIMENTAL PROCEDURE

Analysis.—With the exception of the lignin determination the analytical methods adopted by the Technical Association of the Pulp and Paper Industry[5] were followed.

It was observed that the residue of a sample digested with 72 per cent sulphuric acid for 16 hours was difficult to filter through an alundum crucible (RA—98). By increasing the length of time for hydrolysis from 16 to 24 hours, however, the lignin was satisfactorily filtered, indicating that the cellulose or nonlignous bodies in canton are more resistant to the action of the acid hydrolysis than materials ordinarily used in the cellulose industry. The analysis of the dried stalk of the Canton plant is recorded in Table 2.

TABLE 2.—*Analysis of the stalk of the Canton plant.*

Constituents.	Per cent.
Extractives:	
Alcohol-benzene	7.71
Alkali (1 per cent NaOH)	35.82
Cold water	13.18
Hot water	1.34
Pentosans	14.55
Lignin	22.86
Ash	5.21
Total cellulose	50.04
Ash in cellulose	0.42
Ash-free cellulose	49.62
Alpha cellulose in stalk	43.63

The total cellulose content of Canton is somewhat lower than that of wood ordinarily used in paper making. The alpha cellulose content is also low, indicating that the pulp is made of components soluble in 17.5 per cent alkaline solution.

Canton stalk contained an unusually high percentage of extractives and pentosans.

---

[5] Technical Association of the Pulp and Paper Industry. New York (September 15, 1936).

Digestion.—The digestion of the dried Canton stalk was made by means of the soda process in an autoclave of 5-liter capacity. The results are shown in Table 3.

TABLE 3.—*Digestion of Canton stalk by the soda process.*

Sample.	Sodium hydroxide.				Time of digestion.	Temperature.	Pulp yield.
	Concentration.		Amount used.				
	Grams per liter.	*Per cent.*	*Liters.*	*Grams.*	*Hrs.*	°*C.*	*Per cent.*
1	59.33	5.93	1.5	89.0	5.0	160	28.5
2	47.46	4.75	1.5	71.2	5.0	160	29.9
3	35.60	3.63	1.5	53.4	5.0	160	32.1
4	27.60	2.76	2.0	55.2	8.0	160	33.4
5	27.60	2.76	2.0	55.2	8.0	155	32.9
6	26.70	2.67	2.0	53.4	7.5	160	32.8

[a] Three hundred fifty-six grams of oven-dried material was used for each sample.

Three digestions (samples 1, 2, and 3) were made to study the effect of the concentration of chemicals on the yield and quality of the pulp, and three digestions (samples 4, 5, and 6) were made to determine the effect of temperature. Concentration, chemicals, and pulp yield were calculated on the basis of the oven-dry weight of the raw material. The heat was gradually raised from room temperature to the maximum limit employed for each sample and maintained constant at that point until the end of the digestion. The maximum limits for the various samples ranged from 155 to 160°C. The time indicated in Table 3 includes an hour that was allowed for the heat to reach the maximum temperature.

Effect of alkali concentration and temperature on pulp yield.—Compared with the total cellulose in Table 2, the pulp yield on digestion (Table 3) is relatively low, indicating that a good deal of the available fiber in Canton dissolves readily in alkaline pulping solution at elevated temperatures. In digesting the material with a liquor concentration of 59.33 grams per liter the pulp yield is low, amounting to 28.5 per cent based on the oven-dry weight of the stalk. A decrease in the alkali concentration from 59.33 to 27.6 grams per liter gives a corresponding increase in the pulp yield from 28.5 to 33.4 per cent. It appears, therefore, that a decrease in concentration of 1 gram per liter gives an increase in pulp yield of approximately 0.15 per cent.

Slight variations in temperature at the digestion range had little effect on the pulp yield. The trivial difference in pulp yield of samples 4, 5, and 6 (Table 3) is an indication that a 5° change in the cooking temperature (155 to 160° C.) is insufficient to affect the results of digestion to any appreciable extent.

The physical properties of the pulp.—After digesting the canton stalks, 50 grams of the resulting pulp, calculated on an oven-dry basis, was hollandered (beaten) for about a half hour and then made into test sheets. These sheets were prepared in accordance with the official methods of the Forest Products Laboratory at Madison, Wisconsin. They were tested for weight, thickness, and bursting strength. The results are given in Table 4.

TABLE 4.—*Properties of test sheets prepared from Canton pulp hollandered for a half hour.*

Sample.	Concentration of cooking solution.	Ream weight (25×40 inch, 500).	Thickness.	Bursting strength, lbs. per sq. in.	Bursting ratio.
	Grams per liter.	*lbs.*	*inch.*	*pts.*	*pts. per lb. per ream.*
1	59.33	45.5	0.0042	61	1.34
2	47.46	53.7	0.0046	76	1.43
3	35.60	39.9	0.0038	60	1.51
4	27.60	49.6	0.0043	80	1.62
5	27.60	45.5	0.0041	82	1.65
6	26.70	43.3	0.0041	77	1.70

The matting quality of the unbeaten pulp is poor, but with a 30-minute beating it can be formed into sheets without difficulty. Samples of the pulp were analyzed for their various constituents, such as cellulose, alpha cellulose, pentosans, and lignin. In addition their bleach requirements were also tested. We found that the pulps obtained from all the digestions were difficult to bleach.

A gradual decrease in the concentration of the cooking solution caused a corresponding increase in the strength of the pulp, provided other factors were maintained constant. The increase in strength (bursting ratio) reached 1.51 points per pound per ream at a liquor concentration of 35.6 grams per liter and a total volume of 1.5 liters. As the concentration of the digesting solution was further decreased to 27.6 grams per liter, with a simultaneous increase in volume to 2 liters, the bursting strength ratio of the pulp increased correspondingly to 1.62 points per pound per ream (Table 4, experiment 4).

From a concentration of 27.6 to 26.7 grams per liter there was an increase from 1.62 to 1.70 pounds per ream in the bursting ratio. This decrease in concentration amounts to 0.9 gram per liter with a corresponding decrease in time of digestion of 8 to 7.5 hours (Table 3).

On the cellulose content of the pulp.—The effect of alkali concentration on the total cellulose and alpha cellulose contents of the pulps is relatively small, a maximum value being obtained when the concentration of the cooking liquor is 27.6 grams per liter (Table 5, experiment 5).

In Table 5 is given the analysis of unbleached Canton pulp. These results compared with those recorded in Tables 3 and 4 show that the total cellulose content and the strength quality of the pulp are not affected to any marked extent by a small variation of the digestion temperature. In the light of this finding it may be inferred that a small variation in range of digesting temperature produces no material effect on the yield and quality of the pulp.

TABLE 5.—*Analysis of unbleached Canton pulp.*

Sample.[a]	Total cellulose.	Alpha cellulose.	Lignin.	Pentosans.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1	80.40	67.2	3.20	6.4
2	85.83	69.4	5.62	6.4
3	87.30	68.6	6.43	8.4
5	87.70	70.3	5.97	5.7
6	87.20	69.8	4.27	8.6

[a] These samples were the same as those recorded in Tables 2, 3, and 4.

NOTE.—Pulp from sample 4 was not analyzed.

The data on the strength ratio of test sheets of paper made from unbleached Canton pulp are presented in Table 6. This pulp was beaten about 30 minutes. The results show that this paper is comparable in strength to imported brown or wrapping paper.

TABLE 6.—*Test sheets from Canton pulp compared with a commercial wrapping paper.*

Sample.	Ream weight (25×40-inch, 500).	Thickness.	Bursting strength, lbs. per sq. in.	Bursting ratio.
	lbs.	*inch.*	*pts.*	*pts. per lb. per ream.*
Canton	46.3	0.0042	73	1.54
Commercial	71.9	0.0058	77	1.07

SUMMARY

Canton fiber can be converted into pulp by the soda process. The pulp is suitable for the manufacture of strong unbleached paper.

Soda pulp from Canton fiber requires a large amount of bleach to get the color to a medium degree of whiteness.

Sheaths of Canton, properly cut, are bulky, requiring a relatively large space for digestion.

Concentration of the cooking solution (sodium hydroxide) shows a definite effect on the yield and quality of the pulp. If other factors are maintained constant, the pulp yield generally increases with a decrease in the concentration of the cooking liquor. A maximum of 33.4 per cent based on the oven-dry weight of the raw material being attained when the concentration is 27.6 grams per liter.

A small variation in the cooking temperature from 155 to 160° C. shows no material effect on the yield and quality of the pulp.

PREPARATION AND ANALYSIS OF RUN MANILA COPAL

By CARMEN LL. INTENGAN and AUGUSTUS P. WEST
Of the Bureau of Science, Manila

THREE TEXT FIGURES

Manila copal resin is obtained from a tree known botanically as *Agathis alba* (Lam.) Foxw. This is a large tree that grows in the Philippines from the extreme north of Luzon to the southernmost islands of this group. The copal resin is contained in the bark of this tree and oozes out whenever the tree is cut. The resin is used principally for making high-grade varnishes.

This paper is a continuation of our work on Philippine resins. In previous reports[1] methods were given for analyzing and refining Manila copal. It was found to consist mostly of resin acids together with some terpenes, resenes, and material insoluble in alcohol.

Soft Manila copal is not soluble in drying oils such as linseed oil. In order to make oil varnishes with this resin it is customary to heat it until volatile constituents, such as water, terpenes, and decomposition products have been removed. This heating process is known in the varnish industry as running.

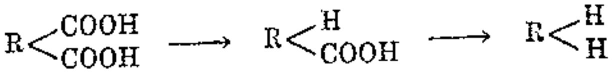
Recently we had occasion to prepare some samples of run copal. In order to ascertain the difference in the composition of the copal, before and after running, a method was devised for analyzing the run copal. Details of this analytical procedure and results showing the composition of natural and run copal are given in this paper.

Several investigations[2] have indicated that some of the acids in Manila copal are dibasic. When the resin is run (heated) at a temperature of about 300 to 310° C., to remove volatile constituents, the dibasic acids are converted to monobasic, thus reducing the acidity of the copal. Continued heating of the copal at a temperature somewhat above 310 ° C. tends to convert the monobasic acids into hydrocarbons as follows:

---

[1] Tanchico, S. S., and A. P. West, Philip. Journ. Sci. 73 (1940) 259–283; G. D. Manalo and A. P. West, ibid. 285–290.

[2] Wolff, H., Farbenztg. 29 (1924) 2039; P. Horrmann and N. Kroll, Arch. Pharm. 265 (1927) 214; L. Ruzicka and J. R. Hosking, Ann. 469 (1929) 147.



$$R\genfrac{}{}{0pt}{}{<COOH}{<COOH} \longrightarrow R\genfrac{}{}{0pt}{}{<H}{<COOH} \longrightarrow R\genfrac{}{}{0pt}{}{<H}{<H}$$

In such a series of thermal transformations in resins there are likely to be side reactions that may yield both volatile and nonvolatile products.

EXPERIMENTAL PROCEDURE

The Manila copal used in this investigation was kindly presented to us by the F. E. Zuellig Company, copal dealers, Manila, and consisted entirely of the soft variety. That is, except for the foreign matter and gelatinous material contained in it, the resin was soluble in alcohol. Average characteristic samples obtained from a definite location were powdered finely and the powder mixed thoroughly to render uniform samples. The copal was analyzed in accordance with a method devised in a previous investigation[3] (text fig. 1).

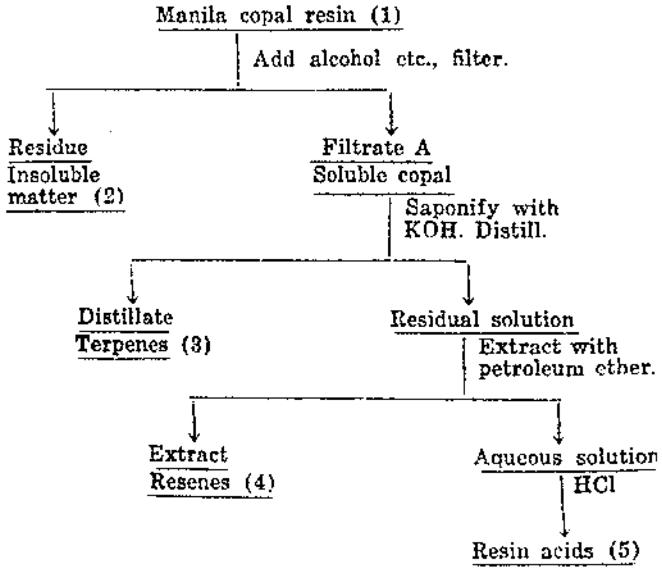


FIG. 1. Analysis of Manila copal.

---

[3] Tanchico, S. S., and A. P. West, Philip. Journ. Sci. 73 (1940) 259–283.

After the composition of the copal was ascertained it was run as indicated in Fig. 2.

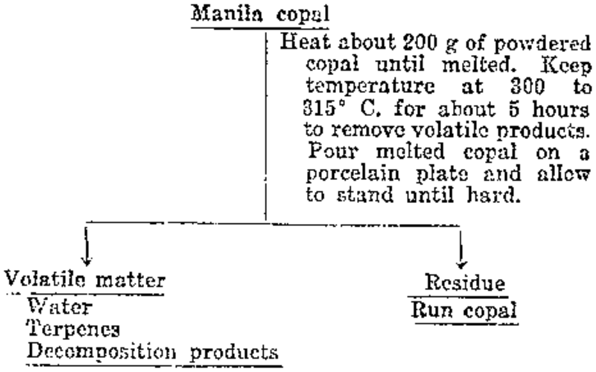

Manila copal
Heat about 200 g of powdered copal until melted. Keep temperature at 300 to 315° C. for about 5 hours to remove volatile products. Pour melted copal on a porcelain plate and allow to stand until hard.
Volatile matter
Water
Terpenes
Decomposition products
Residue
Run copal

FIG. 2. Preparation of run Manila copal.

About 200 grams of the powdered resin were placed in a distilling flask which was then connected to a condenser. The flask was gradually heated over asbestos wire gauze for about 1 to 1.5 hours, depending on the sample, until the frothing subsided and the melt was gently boiling. The heating was then continued at a temperature of about 300 to 315 ° C. for about 4 hours longer to complete the running process. The hot liquid was finally poured on a porcelain plate and allowed to cool. It was then broken into lumps which were placed in a bottle that was stoppered securely and kept in a dark place.

The same procedures were employed to determine the constants of the copal both before and after running.

Acid number.—The acid number is ascertained by treating approximately 1 gram of the powdered copal with 50 cubic centimeters of a mixture consisting of neutral absolute alcohol and benzene (25 cc each) and titrating directly with seminormal alcoholic potassium hydroxide in the presence of phenolphthalein.

Saponification number.—For the determination of the saponification number approximately 1 gram of powdered copal is treated with 50 cubic centimeters of absolute alcohol, and 25 cubic centimeters of seminormal alcoholic potassium hydroxide is added. The mixture is heated on a steam bath with a reflux condenser for 2 hours. The solution is then cooled and the excess alkali titrated with seminormal sulphuric acid in the presence of phenolphthalein.

Ester number.—The ester number is the difference between the saponification and acid numbers.

Data on the constants of Manila copal, before and after running, are given in Table 1.

TABLE 1.—*Constants of Manila copal before and after running.*

The copal was run (heated) at 300 to 315° C. for 5 hours.

Sample.	Constants.					
	Before running.			After running.		
	Saponification No.	Acid No.	Ester No.	Saponification No.	Acid No.	Ester No.
35	188.66	129.04	59.62	97.23	83.55	13.68
36	204.64	123.23	81.41	108.18	92.78	15.40
37	171.56	107.78	63.78	101.80	76.83	24.97
38	197.17	125.53	71.64	95.50	82.80	12.70
39	168.85	109.40	59.45	98.87	78.92	19.95
40	152.46	109.94	42.52	73.11	67.21	5.99
50	209.47	132.97	76.50	93.50	71.15	22.35
51	213.35	140.82	72.53	125.52	103.14	22.38
52	217.15	141.24	75.91	131.94	108.93	23.01
53	165.41	106.45	58.96	102.96	81.41	21.55
54	184.58	119.61	64.97	108.98	88.44	20.54

NOTE.—Samples 35, 36, 38, and 50 were obtained from Davao Province; 39, 53, and 54 from Palawan Province; 37 from Tayabas Province; 40 from Nueva Ecija Province; 51 and 52 from Surigao Province.

As shown in Table 1, the saponification, acid, and ester numbers of the copal were decreased very considerably by the running process. These lower acid values are desirable when the copal is intended for making oil varnishes.

Analysis.—Preliminary experiments were carried out to ascertain a convenient procedure for separating the constituents in Manila copal that has been run. A method that gave satisfactory results is outlined in Fig. 3.

The powdered run copal (50 grams) is treated with a mixture consisting of equal parts (250 cc each) of benzene and aldehyde-free absolute alcohol.[4] The mixture is heated on a steam bath for about a half hour to dissolve the resin.

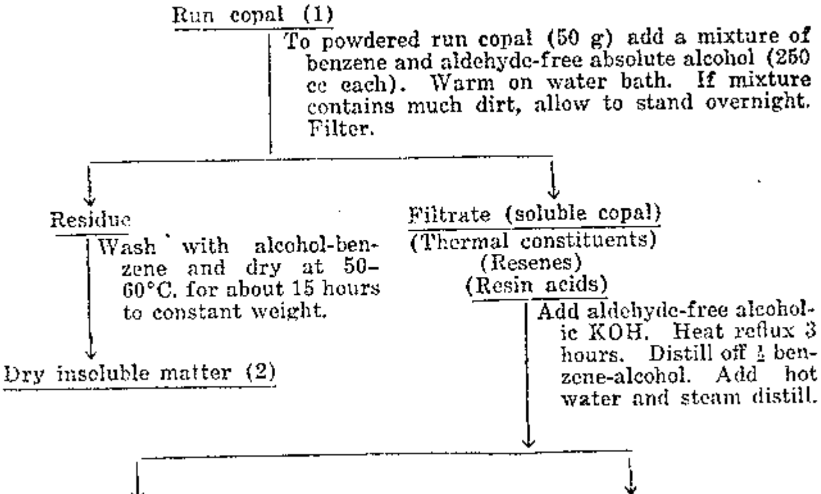
Ordinary alcohol contains aldehydes that polymerize to form resins. Aldehyde-free absolute alcohol was used throughout this work when alcohol was required as a solvent.

Insoluble matter.—If much insoluble matter is present the heating is continued for about two hours longer or until all the soluble resin is apparently dissolved. The mixture is then allowed to stand overnight to facilitate the subsequent filtration. The mixture is filtered through a large weighed filter paper. The insoluble matter is washed with the benzene-alcohol mixture and the filtered washings are added to the soluble copal solution. The filter with the insoluble matter is allowed to drain on layers of filter paper, after which it is dried in an oven at 50 to 60°C. for about 15 hours or longer until the weight of the insoluble matter (2) becomes constant. When much residue is present the drying may be facilitated by opening the partly dried filter and spreading the residue in a somewhat thin layer. Use of a vacuum oven also hastens the drying.

---

[4] Dunlop, F. L., Journ. Am. Chem. Soc. 28 (1906) 397.

Soluble copal.—The filtrate from the insoluble matter is a benzene-alcohol solution that contains the soluble portion of the run copal, which consists of thermal constituents, resenes, and



To powdered run copal (50 g) add a mixture of benzene and aldehyde-free absolute alcohol (250 cc each). Warm on water bath. If mixture contains much dirt, allow to stand overnight. Filter.

Wash with alcohol-benzene and dry at 50–60°C. for about 15 hours to constant weight.

Add aldehyde-free alcoholic KOH. Heat reflux 3 hours. Distill off ½ benzene-alcohol. Add hot water and steam distill.

Extract with ether. Separate. Dry ether extract with anhydrous Na_2SO_4. Filter. Distill off ether-benzene. Residue is dried at 40–50°C. for about 3 hours to constant weight.

Volatile thermal constituents (3)
Residual mixture
(Nonvolatile thermal constituents)
(Resenes)
(Potassium salts of resin acids)

FIG. 3. Analysis of run Manila copal.

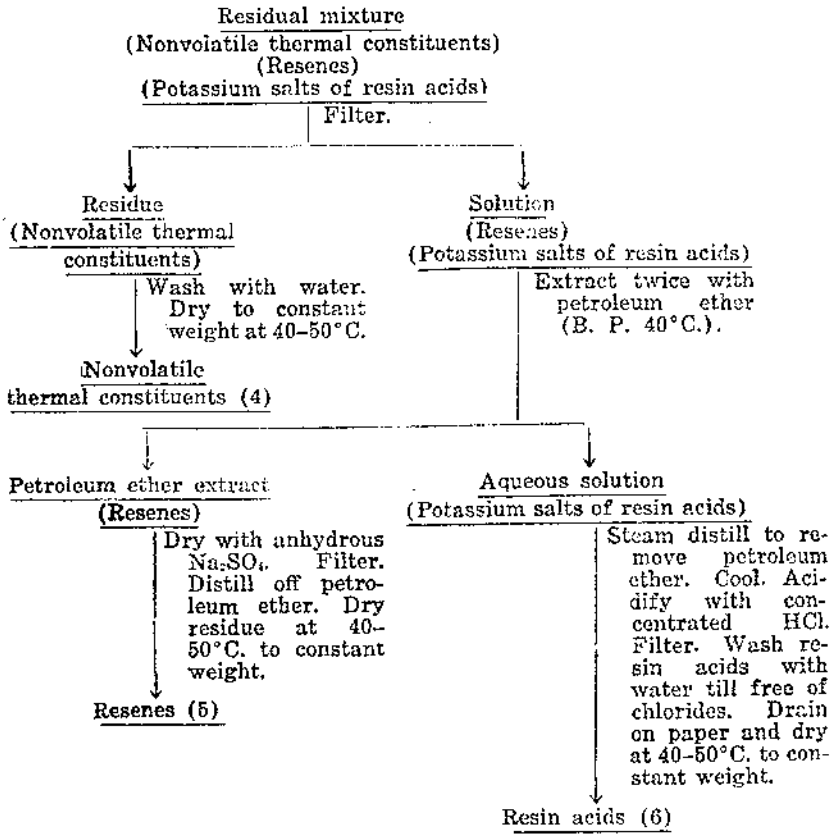

Residual mixture
(Nonvolatile thermal constituents)
(Resenes)
(Potassium salts of resin acids)
Filter.
Residue
(Nonvolatile thermal constituents)
Wash with water. Dry to constant weight at 40–50°C.
Nonvolatile thermal constituents (4)
Solution
(Resenes)
(Potassium salts of resin acids)
Extract twice with petroleum ether (B. P. 40°C.).
Petroleum ether extract
(Resenes)
Dry with anhydrous Na₂SO₄. Filter. Distill off petroleum ether. Dry residue at 40–50°C. to constant weight.
Resenes (5)
Aqueous solution
(Potassium salts of resin acids)
Steam distill to remove petroleum ether. Cool. Acidify with concentrated HCl. Filter. Wash resin acids with water till free of chlorides. Drain on paper and dry at 40–50°C. to constant weight.
Resin acids (6)

FIG. 3. Analysis of run Manila copal.—Continued.

resin acids. Volatile matter is expelled from the copal during the running (thermal) process and the new substances formed in the run copal we called thermal constituents.

Volatile thermal constituents.—The benzene-alcohol solution of the run copal is treated with an alcoholic solution of potassium hydroxide sufficient to neutralize the resin acids and to saponify any saponifiable material contained in the copal solution. The constants of the run copal suggest the required amount of alkali to be used. About 10 per cent excess should be employed. After the addition of the alkali the mixture is boiled (reflux) for about 3 hours to complete the saponification. About half the solvent is then removed by distilling. The residue is treated with hot water and steam distilled for about 18 hours until the distillate no longer has an odor of volatile thermal constituents—substances produced in the copal during the running process and which may be steam distilled from the alkaline solution.

The distillate containing the volatile thermal constituents is extracted with ether. The ethereal extract is dried with anhydrous sodium sulphate, filtered, and the solution distilled on a water bath. The residue is then dried at a temperature of 40 to 50° C. for about 3 hours to constant weight. This process gives the volatile thermal constituents (3) separated from the run copal.

Nonvolatile thermal constituents.—After the volatile thermal constituents are removed by distilling, the residual solution is filtered to get the insoluble, nonvolatile, thermal constituents. These are washed with a small amount of water and the aqueous washings added to the solution containing the resenes and potassium salts of resin acids. The filter containing the nonvolatile thermal constituents is drained on layers of filter paper and then dried for, perhaps, several days at a temperature of 40 to 50°C. to constant weight. The nonvolatile thermal constituents (4) are thus obtained.

Resenes.—The solution containing the resenes and potassium salts of resin acids is extracted twice with petroleum ether (B. P. 40°C.). The petroleum ether extracts are combined and dried with anhydrous sodium sulphate and filtered. The petroleum ether is then removed by distilling and the residue dried at a temperature of 40 to 50°C. to constant weight. The product represents the resenes (5).

Resin acids (6).—The aqueous solution containing the potassium salts of resin acids is steam distilled to remove petroleum ether. It is then cooled to room temperature and acidified with concentrated hydrochloric acid to precipitate the resin acids. The acids are removed by filtering and washed with water until free of chlorides. The filter containing the acids is then drained on layers of filter paper. The residue is finally dried for some days at a temperature of 40 to 50°C. to constant weight, giving resin acids (6).

This method of analysis enables us to separate the run copal into its various constituents consisting of insoluble matter, thermal constituents, resenes, and resin acids.

A sample of Manila copal from Palawan Province was run at a temperature of 300 to 315°C. for 5 hours. The constants and analysis of this copal, before and after running, are given in Table 2. Also included are the constants of the resin acids from the natural and run copal. Similar results are given in Table 3.

TABLE 2.—*Composition of raw Manila copal before and after running.*

Constants and analysis.	Copal.	
	Before running.	After running.
Constants:		
Saponification No.	170.90	99.80
Acid No.	108.89	80.31
Ester No.	62.01	19.49
Analysis:		
Insoluble matter	0.70	0.56
Terpenes	15.03	
Resenes	7.50	9.48
Thermal constituents:		
Volatile		10.44
Nonvolatile		3.65
Resin acids	74.55	74.71
Water (by difference)	2.22	
Total	100.00	98.84
Constants of resin acids:		
Saponification No.	177.67	108.65
Acid No.	144.31	88.95
Ester No.	33.36	19.70

NOTES.—The copal was run (heated) at 300 to 315° C. for 5 hours. The sample before running was soft copal, not refined, from Palawan Province.

TABLE 3.—*Composition of Manila copal before and after running.*

Constants and analysis.	Copal.	
	Before running.	After running.
Constants:		
Saponification No.	178.33	102.25
Acid No.	115.85	84.19
Ester No.	62.98	18.06
Analysis:		
Terpenes	12.65	
Resenes	5.27	7.06
Thermal constituents:		
Volatile		9.45
Nonvolatile		2.60
Resin acids	80.64	80.51
Total	98.56	99.52

NOTES.—The copal was run (heated) at 300 to 315° C. for 5 hours. The sample before running was refined copal that contained no insoluble matter.

The process of running not only gave a decided decrease in all the constants, but also made a marked difference in the composition of the copal. The terpenes and water in the natural copal were removed by running but the insoluble matter and resenes were not greatly affected. Running did not appreciably change the amount of resin acids in the copal. However, the nature of the acids was affected considerably, as shown by the reduction in the acid number.

During the running (thermal processing) of the copal new substances are formed in the run copal. As we have not yet identified these substances we designated them by the term "thermal constituents." They are of two kinds, volatile and nonvolatile. The volatile may be steam distilled from the alkaline solution, while the nonvolatile remains behind. These thermal constituents were probably the result of thermal side reactions that occur during the running process.

The analyses of two more samples of run copal are given in Table 4. These data are similar to those for the run copal in Tables 2 and 3.

TABLE 4.—*Composition of run copal.*

Composition.	Sample.	
	53.	54.
Insoluble matter	0.41	....
Resenes	9.00	8.13
Thermal constituents:		
Volatile	9.93	10.03
Nonvolatile	1.51	2.30
Resin acids	78.59	78.33
Total	99.44	98.79

NOTES.—Sample 54 was obtained by running a refined copal that contained no insoluble matter. The constants of these samples, both before and after running, are given in Table 1.

In Table 5 is given a comparison of the amount of thermal constituents developed in four samples of Manila copal during the running process. These data were compiled from the results presented in Tables 2, 3, and 4.

The amount of volatile thermal constituents formed during the running process varied from 9.45 to 10.44 per cent, while the nonvolatile varied from 1.51 to 3.65 per cent. This variation is probably due to somewhat irregular heating during the running process. Differences in the composition of the natural copal before running may also influence the results.

TABLE 5.—*Comparison of thermal constituents developed in run copal.*

Thermal constituents.	Tables.			
	2.	3.	4.	
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Volatile	10.44	9.45	9.93	10.03
Nonvolatile	3.65	2.50	1.51	2.30
Total	14.09	11.95	11.44	12.33

NOTE.—These data were compiled from Tables 2, 3, and 4.

SUMMARY

Manila copal is a resin that is used principally for making high-grade varnishes. It is obtained from the bark of *Agathis alba* (Lam.) Foxw.

Soft Manila copal is not soluble in drying oils. In order to make oil varnishes with this resin it is customary to heat it to remove volatile constituents and decomposition products. This heating (thermal) process is known in the varnish industry as running.

In order to ascertain the difference in the composition of the copal, before and after running, a method was devised for analyzing the run copal. Details of this analytical procedure are given in this paper.

The constants of the copal were determined both before and after running. The saponification, acid, and ester numbers were decreased very considerably by the running process. These lower acid values are desirable when the copal is intended for making oil varnishes.

The copal was analyzed both before and after running. As a result of the running process the terpenes and water in the fresh copal were eliminated. The insoluble matter and resenes were not greatly affected. The running did not appreciably change the amount of resin acids in the copal. However, the nature of the acids was affected considerably as shown by the reduction in the acid number.

During the running (thermal processing) of the copal new substances are formed in the run copal. As we have not yet identified these substances we designated them by the term "thermal constituents." They are of two kinds, volatile and nonvolatile. The volatile may be steam distilled from alkaline solution while the nonvolatile remain behind.

Four samples of the run copal were analyzed. The amount of the thermal constituents in these samples varied from 9.45 to 10.44 per cent for the volatile and 1.51 to 3.65 per cent for the nonvolatile.

We expect to investigate different thermal constituents which are gradually formed during the running (thermal) process.

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. Analysis of Manila copal.
2. Preparation of run Manila copal.
3. Analysis of run Manila copal.

BOOKS

Books reviewed here have been selected from books received by the Philippine Journal of Science from time to time and acknowledged in this section.

REVIEWS

Careers in the Mineral Industries; a Vocational Booklet for Use in Secondary Schools. By Thomas T. Reed. Published by the American Institute of Mining and Metallurgical Engineers through the Seeley W. Mudd Memorial Fund. 1st rev. ed. New York, 1939. 32 pp., Price, paper, $0.25.

This pamphlet, presented in question and answer form, gives the scope of the different careers in the mineral industries. It points out how courses leading to these careers can be pursued with advantage; what it costs to pursue these courses; and what opportunities await one in these fields after graduation. It lists the American colleges and schools offering curricula in mineral technology. The pamphlet is primarily intended to guide vocational councellors and advisers, principals, and teachers called upon to help young people plan a career in the mineral field. It is invaluable in that it presents facts about these careers in a concise and convenient manner.—R. T. S.

Audels Diesel Engine Manual. By A. B. Green and R. A. Zoeller. New York, Theo. Audel & Co. 354 pp., illus. Price, $2.

The Audels-Diesel engine manual is a practical and concise treatise dealing with the theory and practical operation, maintenance, construction, and repair of modern Diesel engines, with profuse illustrations.

This book is based on wide experience on the part of the authors in servicing and operation. It is an essential guide for those who are interested in acquiring a general knowledge about the fundamental and operating principles of high speed Diesel engines and semi-Diesel engines, including practical pointers on operation, inspection, maintenance, and repair of both four-stroke and two-stroke cycle Diesel engines. It is very helpful to students, owners, operators, mechanics, salesmen, and engineers.—B. R. D.

Poultry Practice. By Leland Bushnell with the Collaborations of Edwin J. Frick, Marvin J. Twiehaus, and others. Chicago, Veterinary magazine corporation, 1940. 160 pp., illus. Price, $1.

The articles in this book were published in the past issues of Veterinary Medicine, but I came to appreciate the value of the correlated subjects as a whole only when I read them again in book form. Although the book begins and ends by challenging the veterinary profession on the high rate of poultry mortality and the control of diseases, it contains valuable scientific information for the veterinarian on poultry problems. It contains papers from many outstanding investigators on the subject, and undoubtedly will prove helpful to those interested in advancing the poultry industry. Aside from the broad subjects it deals with, like poultry management, sanitation, breeding and nutrition, it emphasizes the common poultry diseases and parasites, together with the known methods of control, treatment, and eradication.

Included in the collection is the rôle played by the avian embryo, as a valuable aid in the study of diseases and in the preparation of vaccine, as well as avian surgery, which is of interest to veterinary practitioners. Indeed, this book should prove highly useful to practitioners who should be aroused to take a deep interest in serving the poultry industry as they serve other branches of animal husbandry. It gives the layman a graphic picture of the veterinary profession and thus enables him to avail himself of the services of a skilled veterinarian.—B. B. B.

The Autobiography of an Egret. By E. A. McIlhenny. New York, Hastings house, 1939. 58 pp., illus. Price, $2.

This little book portrays the life history of the American egret in the form of an autobiography. Beautiful photographs taken from life, some of which must have been extremely difficult and risky to take, are presented in a sequence that describes almost all the phases of the life of this bird. The text is written in simple language that makes it easy reading even for children. This book should be included in the collection of every lover of nature and every children's library.—C. G. M.

The Story of the Plant Kingdom. By Merle C. Coulter. Chicago, The University of Chicago press, 1940. 270 pp., illus. Price, $2.50.

This work, consisting of 20 chapters, with numerous illustrations and footnotes, presents the essentials of botanical science in a very simple and convenient manner by minimizing the use of the very technical and detailed terminology that is quite common to most textbooks in botany, and thus gives the subject matter much interest for a beginner in botany. The presentation of brief but coherent sketches of the plant kingdom, followed by an analytical study of the functions and environmental relationships of living organisms, makes the text wholesome reading that will surely be of great use to teachers in our high schools.—J. B. J.

Accepted Foods and Their Nutritional Significance. Compiled by the Council on Foods of the American Medical Association, Chicago. 492 pp. Price, $2.

This book gives an account of the satisfactory food products submitted to the Council on Foods of the American Medical Association. General classes of foods are listed as follows: Fats, oils, and their products; fruit juices; canned and dried fruits and fruit products; grain and grain products; infant foods; meat, fish, and sea foods; milk and milk products; sugars and syrups; vegetables; beverages, coffee, tea, and the like; and flavoring extracts.

This publication is a handy reference manual of interesting and instructive information on the composition and calorific value of foods. It explains the rules and regulations pertaining to the composition and advertising of foods as adopted by the Council.

Numerous analyses of foods and food products are recorded. Most of these reports have the common food determinations (ash, fat, nitrogen, and other elements), but are lacking in the important vitamin constituents. However, the mineral contents (calcium, phosphorus, and iron) of a number of fruits and vegetables are included.

This volume will serve as a valuable addition to the library of anyone interested in nutrition, the chemistry of foods, and the medical rules and regulations pertaining to the food industry. —A. P. W.

Medical Education in the United States 1934–1939. Prepared for the Council on Medical Education and Hospitals of the American Medical Association. By Herman G. Weiskotten and others. Chicago, American Medical Association, 1940. 259 pp., illus. Price, $1.

This book contains an extensive and comprehensive report prepared for the Council on Medical Education and Hospitals of the American Medical Association by a committee composed of two medical school deans, the Secretary, and a member of the Council, and gives the result of a survey made of sixty-six medical schools in the United States during 1934 and 1935 together with developments up to 1939. The sources of information were :(1) the answers of deans to a set of questionaires sent out by the Council, (2) the result of visits by the Chairman, Doctor Weiskotten, and "companion," and (3) in many instances, catalogs, laboratory outlines, and other literature dealing with the conduct of courses. The report is mainly a factual exposition and summary of the results of the survey, and neither makes comments on, nor publishes the evaluation of, any particular medical school or department. Under separate and well-apportioned chapters the report describes the committee's findings regarding the organization and administration of the sixty-six medical schools, their educational programs, instructional personnel, library and clinical facilities, as well as student and financial administration. It has also separate chapters dealing with each of the preclinical and clinical departments of the various medical schools, especially contrasting the conditions found in the ten highest and the ten lowest ranking departments, the evaluation having been based on physical facilities, personnel, educational program, and research and scientific interest.

The facts and comments of the survey report should be interesting and instructive to administration officers of universities and medical schools, to their agencies such as the committee on admission, on promotion, on catalog and curriculum, and to heads of departments.—E. B.

Medicolegal and Industrial Toxicology. By Henry J. Eilmann. Philadelphia, The Blakiston Company, 1940. 324 pp. Price, $3.

This small volume, which is divided into five parts, such as poisons and drugs, criminal investigations, medicolegal examinations of miscellaneous nature, industrial poisoning, and occupational diseases, is a useful, important, and valuable guide to medicolegal officers and coroners, health and industrial physicians, lawyers, insurance adjustors, forensic toxicologists, laboratory experts, and many others. The chemical composition, physical and chemical properties, toxic effects, symptoms, postmortem signs, isolation, and chemical detection of the common industrial and occupational poisons and poisonous drugs, are briefly but adequately described. The sensitivity limit of the detection of hydrocyanic acid or cyanides by the prussian blue test as performed and reported by the author is 1:5,000,000 dilution, which is 100 times more than the reported and generally accepted concentration.

The simple methods of determining blood, seminal, and other stains, fibers and hairs, and arson chemicals; and the detection and determination of death by strangulation, throttling, hanging, choking, drowning, and many other cases connected with criminal investigations are reasonably presented. The discussion and presentation of every subject contained in this book emphasize, however, its applications to our Workmen's Compensation Law, Act No. 3428 as amended, and to our Employers' Liability Law, Act No. 1874, both of which prescribe and regulate the compensation for employees and the responsibilities of employers in cases of personal injury and death.—G. Q. Q.

The Malarial Therapy of General Paralysis and Other Conditions. By William H. Kupper. Ann Arbor, Michigan, Edwards Brothers, Incorporated, 1939. 155 pp. Price, $2.25.

The author, formerly resident physician of the Florida State Hospital, draws upon his experience in this comparative study of malarial therapy. His own personal cases are not many, but they form a useful supplement to the study which he makes of the results of other workers in the same field.

The most important chapters are those in which he traces the development of the therapy and those in which he describes the different aspects of the therapy. His remarks about the gaps in our knowledge of syphilitic infection are particularly thought provoking, especially with the recent revival of theories concerning a possible exogenous stage in the life cycle of *T. pallidum,* possibly in an insect. The theory goes back to Schaudinn over thirty years ago, and was revived by McDonagh in 1915. Are the causative organisms of syphilis, yaws, malaria, leprosy, and relapsing fever closely related? Suggestive evidence is not lacking. The Wasserman reaction is more consistently given by these five diseases than any other, a life cycle analogous to the life cycle of the plasmodia has been reported, and finally the remissions obtained with malarial therapy do not seem to depend on the production of the fever alone.

The discussion of the malarial therapy of general paralysis is comprehensive. The indications and contraindications, the different methods of inoculation, the advantages and disadvantages of mosquito over syringe inoculation, the course, symptomatology, complications, and prognosis are described. Of particular importance are the notes on the management of the course, the counting of parasites, and the treatment of untoward symptoms. Typical and useful case histories, temperature records, tables, and charts are appended. The statistics of different investigators are included. From them the reader can get an illuminating idea about the work being done in this specialty, the failures and successes, the obstacles already surmounted, and the problems that remain to be solved.—A. B. R.

The Diagnosis and Treatment of Pulmonary Tuberculosis. By John B. Hawes and Moses J. Stone. 2d. ed., rev. by Moses J. Stone, with a foreword by Richard C. Cabot. Philadelphia, Lea & Febiger, 1940. 260 pp., illus. Price, $2.75.

The title of this book might as well have been "Essentials in Pulmonary Tuberculosis." It is a good manual for the lung specialist but is altogether too brief for the beginner. The chapters on history taking, symptomatology, physical examination, and differential diagnosis will readily appeal to the medical man who has had hospital and teaching experience, but may fall short of the needs of the physician at large who has lost contact with his college or hospital since his graduation days. The discussion on collapsotherapy, particularly pneumothorax, is too brief to be of much value to the practitioner who wants to be informed of the actual technique. This part of the book might have been expanded at the expense of chapters on heliotherapy, mental aspects of the tubercular, and rules for clinic procedures. The question of diet in tuberculosis is well presented as sensible and timely advice against the prevalent practice of indiscriminate overfeeding.

As a whole the authors should be commended on their effort. They have brought into the world a worthwhile contribution to medical science, particularly on the subject of tuberculosis. This book should be added to the collection of every medical man and every medical library.—W. V.

RECEIVED

Blue book of the inauguration of the Commonwealth of the Philippines and the induction into office of Manuel L. Quezon, 1st president of the Philippines, and Sergio Osmeña, 1st vice president of the Philippines. Manila, November 15, 1935. 239 pp., illus., plates, ports., map. Price, ₱3; postage, ₱0.20.

COLLINGWOOD, G. H. Knowing your trees. Washington, D. C., The American forestry association, 1937. 109 pp., illus. Price, $1.

KAUFFMAN, ERLE. Kingdom of the trees. Chicago, Reilly and Lee, 1940. 122 pp., illus. Price, $2.

KUPPER, WILLIAM H. Malarial therapy of general paralysis and other conditions. Ann Arbor, Michigan, Edwards Brothers, 1939. 155 pp., tables, charts, illus. Price, $2.25.

LEVISON, JACOB J. The home book of trees and shrubs. With an introduction by Samuel J. Record. New York, Simon and Schuster, 1940. 424 pp., front., illus. Price, $5.

Our government: what it is doing for us. Manila, Bureau of Printing, November 15, 1940. 168 pp., illus. Price, ₱0.50.

SAUNDERS, L. H. Vegetable growing in the tropics. London, Oxford university press, 1940. 120 pp. Price, 3s/6d.

Vitamin E. A symposium held under the auspices of the Food Group (Nutrition Panel) of the Society of Chemical Industry on Saturday, April 22d, 1939, at the School of Hygiene and Tropical Medicine, Keppel Street, London, W. C. 1, England. New York, Chemical publishing co., inc., 1940. 88 pp., illus. Price, $2.

THE PHILIPPINE BUREAU OF SCIENCE

RECENT MONOGRAPHIC PUBLICATIONS

SUMMARY OF PHILIPPINE MARINE AND FRESH-WATER MOLLUSKS. By Leopoldo A. Faustino. Order No. 485. Bureau of Science Monograph 25. Paper, 384 pages. Price, $2 United States currency, postpaid.

SECOND TEN-YEAR INDEX TO THE PHILIPPINE JOURNAL OF SCIENCE, Volume 11 (1916) to Volume 28 (1925). By Winifred I. Kelly. Order No. 486. Bureau of Science Monograph 26. Paper, 381 pages. Price, $2 United States currency, postpaid.

THIRD TEN-YEAR INDEX TO THE PHILIPPINE JOURNAL OF SCIENCE, Volume 29 (1926) to Volume 58 (1935). By Sophie Rodolfo and Amando D. Singson. Philippine Department of Agriculture and Commerce Technical Bulletin 11. Paper, 432 pages. Price, $2.25 United States currency, postpaid.

FILTERABLE VIRUS AND RICKETTSIA DISEASES. By Earl Baldwin McKinley. Order No. 487. Bureau of Science Monograph 27. 442 pages, 70 plates, and 7 text figures. Prices, paper, $2.50; bound in full red keratol, $4, United States currency, postpaid.

EXPERIMENTAL STUDIES OF DENGUE. By James Stevens Simmons, Joe H. St. John, and Francois H. K. Reynolds. Order No. 489. Bureau of Science Monograph 29. Paper, 489 pages, 3 plates, and 159 text figures. Price, $3.50 United States currency, postpaid.

PHILIPPINE LAND MAMMALS. By Edward H. Taylor. Order No. 490 Bureau of Science Monograph 30. Paper, 548 pages, 25 plates and 25 text figures. Price, $2.50 United States currency, postpaid.

THE PHILIPPINE JOURNAL OF SCIENCE

Manuscripts intended for publication in the Philippine Journal of Science should be sent to the Editor, Philippine Journal of Science, Bureau of Science, post-office box 774, Manila, Philippines.

Manuscripts on biology must be accompanied by abstracts for publication in the Biological Abstracts.

Fifty separates of each paper published in the Journal are furnished to the author without charge. Additional copies may be had at the author's expense if ordered when the manuscript is submitted for publication.

The Journal is issued twelve times a year. The subscription price is 5 dollars United States currency per year. Single numbers, 50 cents each.

Subscriptions may be sent to the Division of Publications, Department of Agriculture and Commerce, post-office box 613, Manila, Philippines, or to any of the agents listed below.

Publications sent in exchange for the Philippine Journal of Science should be addressed: Scientific Library, Bureau of Science, post-office box 774, Manila, Philippines.

AGENTS

The Macmillan Company, 60 Fifth Avenue, New York, N. Y.
Martinus Nijhoff, Lange Voorhout 9, The Hague, Holland.
G. E. Stechert & Co., 31–33 East 10th Street, New York, N. Y.
The Maruzen Co., Ltd., 6 Nihonbasi, Tori-Nichome, Tokyo, Japan.

CONTENTS

Page

GRESSITT, J. LINSLEY. Amphibians and reptiles from southeastern China ... 1

BEQUAERT, J. The hornets of the Philippines: Hymenoptera, Diploptera, Vespinæ ... 61

TUBANGUI, MARCOS A., and PANTALEON J. AGUILA. The treatment of schistosomiasis japonica with fuadin ... 69

RAMIRO, MARIANO P., and PRESENTACION A. ESTRADA. Soda process for pulping canton fiber ... 75

INTENGAN, CARMEN Ll., and AUGUSTUS P. WEST. Preparation and analysis of run Manila copal ... 83

BOOKS ... 97

The articles in the Philippine Journal of Science are indexed in the International Index to Periodicals, New York, N. Y.